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Load Levelling

REFLECTIONS ON THE TORQUAY PAPERS

MOST technical interest in the series of six papers presented at the British Electrical Power Convention was aroused by the group of four on very high-voltage transmission, discussed as a whole at Torquay. The main one outlined the considered view of a power system designer of the manner in which the existing national grid might reasonably be electrically strengthened to enable it to carry the peak loads soon to be expected.

Plant Design

The three companion papers represented collective efforts on behalf of groups of manufacturers endeavouring, in co-operation, to anticipate likely needs of the near future, so that they may be ready to accept orders for higher-voltage switchgear, transformers and cables. They demonstrated that plant has been developed in advance of home requirements, which is a peculiar necessity of the British electrical industry because it has always had to look so far ahead.

The demand from abroad for extra high-voltage equipment has preceded and exceeded that from purchasers in this country. That is why the switchgear paper put forward several views of the circuit breaker situation. Members of the B.E.A.M.A. do not want diversity of design, but they do recognize the fact that even at home there is a diversity of opinion about the proper thing to do at any particular time.

Manufacturers to-day simply cannot afford to wait for the adoption of one design as the standard for long-term use. Thus there cannot yet be one answer only to each question, until practical experience gained in service brings about a greater unanimity of thought.

Britain leads all other countries in possessing the four largest short-circuit testing stations in the world, enabling makers to "prove" what they have designed, with reasonable assurance of its suitability for grid reinforcement against mounting peaks of system load. Manufacturers are thus said to "live on the peaks," but it is "far greener in the valleys," as one speaker at Torquay pointed out.

Future Development

The encouragement of domestic consumers which accompanied the load-levelling attempts made between the wars threatened to create new peaks rather than flatten those which existed. First steps now being taken are not in the same direction, for they are towards the country districts. This shifting of development activity outward has commenced one year instead of three after vesting date. It will avoid the mere urbanization of suburbs, but may assume the dimension of a full stride rather than a step forward, in which case distance will become a complicating factor.

If dwellers in widespread rural districts are to receive "service" equal to that offered to townspeople, the removal and redistribution of consumers' appliances (and meters) will involve transport problems of a major order. Instead of allow-

ing, by default, the choice of conveyance to be haphazard, cannot some service be rendered to electric vehicle makers, too, by way of encouragement? Battery-driven trucks and vans are particularly well suited to collection and delivery work. They might be centrally ordered in substantial numbers and then hired by operators, who would be responsible for the general maintenance of the vehicles, leaving major replacements to the central purchasing authority.

The assurance of continuity of business which might thus be built up should be advantageous to both maker and user. A useful off-peak charging load would be created which, incidentally, might encourage the more general employment of this type of vehicle. The idea is not novel, but the scale of B.E.A. operation would be larger than what has been tried before.

SURCHARGE DROPPED

THE announcement on Monday by the Minister of Fuel and Power that the surcharge is not to be repeated this winter will give general satisfaction. Though increases in charges made earlier by the newly set up Boards were in many cases more onerous, they were generally recognized as inevitable. To the anomalous "differential," however, the public reacted vigorously and protests have been widespread. After explaining the purpose of the charge—introduced last winter at his request and in accordance with the recommendations of the Clow Committee—Mr. Gaitskell said he had been informed by the B.E.A. and the Boards that they did not favour the system. In the absence of evidence that it had exercised a decisive influence at peak times he did not propose to ask them to continue it next winter.

LOAD SPREADING AGAIN

REGRETTABLE, but necessary, must be the conclusion on hearing that load-spreading schemes are again to be instituted next winter. Last winter the aim was to reduce the industrial load during the peak hours by 20 per cent; it is now proposed that this should be continued, but with a relaxation to 10 per cent during the 10 a.m.-12 noon period. Discretion is given to the Regional Boards for Industry to vary the arrangements if necessary. Commercial consumers come within the scope of the scheme, but householders are still to be relied upon for voluntary restriction of demand. All this is most undesirable, but it should act as a spur to industrialists, who are subjected to so much dislocation, to insist that all possible measures shall be taken to remedy the power-plant deficiency.

STABILIZED PRICES

AT a time when British manufacturers are being told that their prices must be kept down it is satisfactory to learn that the Associated Dynamo & Motor Manufacturers have again decided that their prices shall remain unchanged in spite of rises in the cost of labour and materials. They are enabled to do this, they say, because of increased output, improved production methods and increased availability of raw materials. The first and third reasons seem to be closely connected. A further reduction in the price of copper has just been announced, with effect from Tuesday last, but the costs of other important commodities show substantial increases compared with a year ago, e.g., electrical sheet steel 14 per cent and insulating materials 17 per cent.

TRAINING BY TELEVISION

THE televising of a series of surgical operations performed at University College Hospital, London, last week for the instruction of delegates to the International Gynæcological Congress was an event worth noting. Considerable importance is attached in medical circles to this means of training students without having to crowd them into the gallery of the operating theatre. The ability to record in this way every phase of the demonstrator's procedure and manipulative dexterity, with remarkable definition of detail, on the screens of monitor receivers installed in a separate lecture hall is most valuable. The method appears to be applicable to other instructional teaching spheres outside the hospitals, while the construction of compactly portable equipment of light weight and about the size of ordinary suitcases sets a new standard in television engineering design.

Developments in Insulating Materials

Electrical Research and the Export Market

By C. G. GARTON

(Electrical Research Association)

APPARATUS which is to be used abroad is often subject to greater extremes of temperature, humidity and biological attack (from fungi, insects, etc.) than those experienced in Britain. These conditions have their worst effect upon insulating materials, which have usually to be of an organic nature. Inorganic substances like glass and mica, although ideally resistant to deterioration, are severely limited by their mechanical nature.

Improvements in insulation come about mainly in three ways. The most fundamental is the invention of new synthetic substances, with properties inherently superior to existing materials. Equally important is the detailed study of the mechanisms by which failures occur. Less fundamental are two problems of development rather than research: the detailed design of equipment to ensure use of the best material for every part and, for some apparatus, the design of casings or coatings to protect the equipment from climatic conditions.

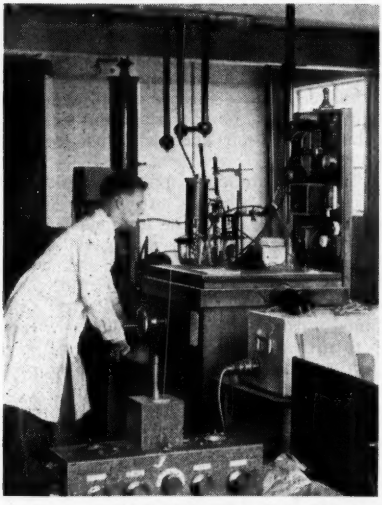
In the last decade some six or seven new synthetic plastics have been developed with properties superior in one way or another to anything previously available. Most of these are so recent that their use is still in the development stage, but the new range of properties available ensures further improvement of equipment as the materials and the conditions for their successful use become known.

Two substances, polyethylene and "Terylene," are due entirely to British chemical research. The former is already well known from its extensive use in high-frequency cables. It has a dielectric loss as low as any available solid, great chemical inertness, and flexibility combined with toughness from sub-zero temperatures up to 60 or 70° C. These properties make it valuable under tropical conditions and it has already been used as a covering for high-voltage busbars. "Terylene," trade name for poly-ethylene-terephthalate, is a new filament-forming material in general resembling

Part of a laboratory for research into the electro-chemistry of insulating materials

"Nylon," although considerably different in chemical structure. Its development is so recent that it is not yet commercially available, but its properties promise an insulating fabric outstandingly resistant to temperature and humidity, combined with great tensile strength. It is stable at 150° C and has lower water absorption than any fabric other than woven glass.

Polyacenaphthylene, a new material resembling polystyrene, derived from a substance occurring in coal tar, was simultaneously developed in Britain and



Laboratory equipment for research into breakdown of dielectric materials

the U.S.A. It is unlikely to have many uses as a pure material, but as a co-polymer with styrene it forms a material with a somewhat higher softening temperature than polystyrene alone.

New materials of American origin, but either made or likely soon to be made in Britain, are the well-known silicone group of substances and the interesting new polymers containing the element fluorine. The best known of these is P.T.F.E. (poly-tetrafluor-ethylene) similar in structure to polyethylene in which hydrogen has been replaced by fluorine. This material, already in use for special purposes, has outstanding thermal and chemical stability, with the same low dielectric loss as polyethylene. It does not soften or decompose on exposure to 250° C, even for long periods, and is completely inert to all solvents and normal chemical reagents. It is difficult to mould, since it does not soften much without thermal decomposition, but it can be sintered together and has even been produced in thin films.

A related polymer, P.C.T.F.E. (poly-chlor-trifluor-ethylene) in which one fluorine atom in four is replaced by chlorine, has mechanical and thermal properties intermediate between polyethylene and P.T.F.E. It provides a mouldable material of good thermal stability, at the sacrifice of a higher dielectric loss.

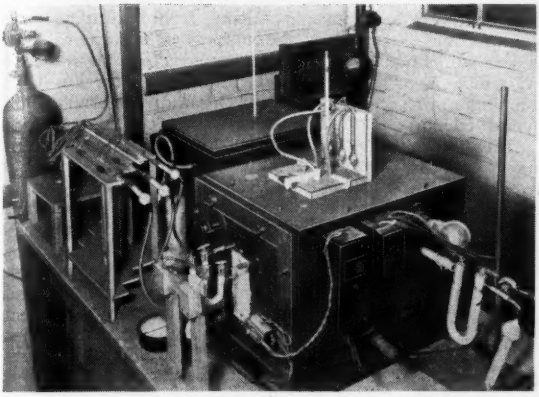
Apart from these wholly new substances, recent research has led to the improvement of several previously known materials. Cellulose acetate, for example, which in its old form is a very indifferent insulator, acquires excellent thermal stability when completely acetylated to form cellulose triacetate. Capacitors made with this dielectric have operated satisfactorily for long periods at 120° C.

Flexible Polystyrene Film

Polystyrene is well known as a rather brittle solid, useful for its low dielectric loss and resistance to moisture, but limited in application by its mechanical properties. Research, originally in Germany, has shown that strong and flexible films of the material as thin as 0.001 cm are possible if the film is extruded in such a way that the long chain molecules are oriented along the length of the film. Film of this type is now produced in Britain. It is mainly important as an alternative to mica for capacitors of high stability and low dielectric loss, but for some applications in electrical measurements it has also the useful property that its absorption current after a long charging time is the lowest of any known thin film material

Before the recent war, Britain imported considerable quantities of electrical insulating paper on account of the higher insulation resistance of the foreign product. The British Electrical Research Association has since shown that the conductivity of a pure paper depends greatly on the kind of ion combined with certain unstable molecular groups in the

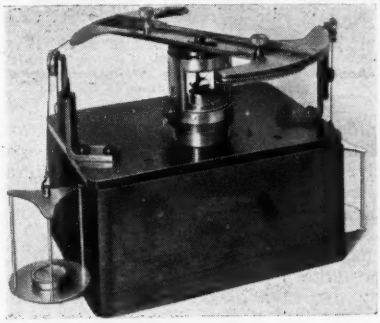
cellulose. By substituting calcium for hydrogen in these groups, paper is now made in Britain with properties at least



Apparatus for measuring moisture penetration through insulating films

equal to the foreign product. Still further improvement has been obtained in the laboratory, but not yet transferred into large scale production.

The same study of paper revealed a previously unknown cause of failure of insulation under d.c. stress at high temperatures. The small leakage currents which flow even in the best insulation can, under some conditions, release nascent hydrogen which attacks some types of insulation with release of conducting products. The leakage current then rises indefinitely until failure occurs. Substances which combine harmlessly with the hydrogen and delay the onset of such conditions were discovered empirically in the U.S.A. and named "stabilizers," although the mechanism of their action was not known. This was elucidated in Britain by the E.R.A. Stabilized capacitors are now being produced on a pilot-plant scale in this country and



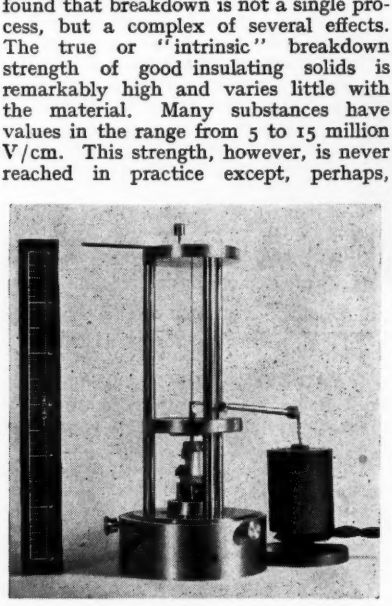
Instrument for the measurement of "creep" in plastics

are especially suited to tropical or other high temperature conditions.

All electrical apparatus containing paper or other moisture absorbing insulation must be protected from atmospheric humidity, particularly in damp climates, and great progress in this respect has been made through experience gained in the war. Capacitors, meters, and even complete radio equipments are now produced which will operate after long immersion in water. Such moisture-tight cases are not always economic and efforts have been made to improve the older method of protection by varnish or wax films. There has been much research into the mechanism of diffusion of water vapour through apparently solid materials and the rate of permeation is now known for most film-forming materials. Great improvements in packaging for transport have resulted. Small apparatus can be sealed in polyethylene envelopes which substantially delay the ingress of moisture. All organic materials, however, have measurable permeability to water, so that vacuum-tight sealing of apparatus in metal casings is the only complete remedy. This has been facilitated by the development in Britain of two alternatives to the not very satisfactory glass-to-metal terminal seal. One uses a ceramic bushing fused to a central conductor and forced tighly into an outer steel ring. The other makes use of the flow properties of P.T.F.E., which can be expanded

to a vacuum-tight fit in metal by driving an over-sized rod into a central hole.

Since most failures of electrical gear arise from breakdown of insulation, research into the mechanism of this process is of great practical importance. Much fundamental work on the subject is carried on by the E.R.A. which has found that breakdown is not a single process, but a complex of several effects. The true or "intrinsic" breakdown strength of good insulating solids is remarkably high and varies little with the material. Many substances have values in the range from 5 to 15 million V/cm. This strength, however, is never reached in practice except, perhaps,



Appliance for determining strain-time curves of plastics for periods down to 10^{-3} sec

under impulse conditions resulting from lightning or switching surges. The effective strength is from ten to one hundred times less than the figures mentioned, breakdown occurring always from some secondary cause. Apart from the electrochemical type of failure described earlier, breakdown may result from overheating by excessive dielectric loss, or by the energy loss of discharges within voids in the insulation, or from an erosive effect of these discharges, which is still under investigation. The very large discrepancy between the intrinsic and the usable strength of insulating materials implies the possibility of future great improvements in the use of insulation.

Insulating materials must frequently withstand, in addition to electric stress, mechanical forces which may be impulsive, resulting from accidental impacts or from short-circuits, or may be continuous, resulting from clamping pressures or the support of a weight. Both impact strength and creep of materials are therefore important and are being investigated. Organic materials differ from metals in that a considerable part of their deformation under a force occurs only gradually, as a creep which may be measurable even for many months after application of the stress. The clamping of transformer windings is a case in which such gradual compression of the material must be known and taken into account. The impact strength of materials depends considerably upon the velocity of impact, the type of fracture changing from ductile to brittle as the velocity increases. This has lately been shown to depend upon the existence of the creep already mentioned and improved methods of impact testing are being developed as a result.

This account is limited to only a small part of the electrical research and development in progress in Great Britain, mainly to a single part of that research —the properties of materials. The total effort devoted to improvement of electrical equipment involves an expenditure of several million pounds per annum and represents a substantial yearly advance in performance and reliability. It cannot be adequately described in a single article.

Electric Traction Statistics

DURING the four weeks to 22nd May covered by the latest issue of "Transport Statistics" (British Transport Commission) 55.3 million kWh (l.v.) was consumed for traction purposes in all regions. This was 8.16 per cent more than in the corresponding period of last year. Consumption per car mile (2.46 kWh) showed a reduction of 0.4 per cent.

The number of train-miles run by electric coaching stock rose by 10.98 per cent to 3,591,000 compared with an increase of 5.9 per cent in the case of steam (total train-miles 14,268,000). London Transport trolley-buses consumed 16.9 million kWh (l.v.), an increase of 1.54 per cent, tram consumption falling by 4.59 per cent to 7.1 million. Consumption per car mile averaged 2.77 and 2.74 kWh respectively.

Views on the News

By REFLECTOR

THE truly outstanding joint exhibit of the Midlands Electricity Board and the British Electrical Development Association at the Royal Show at Shrewsbury last week has not been allowed to pass without a certain amount of criticism on the score of extravagance for a show of only four days' duration Various fantastic figures as to cost have been mentioned and I have been unable to get any confirmation of the £17,000 quoted by someone who should know. At all events it is undoubtedly considerably higher than the £3,000 to which the cost of the display at last year's Royal Show at York was limited, it being felt, no doubt, that with the greater scope of nationalization something more elaborate was called for.

★ ★ ★

Whatever the cost, the display admirably fulfilled its function of drawing attention to the potentialities of electricity on the farm, of selling apparatus and of encouraging the building up of load which is very largely off-peak. Apart from this, it may be mentioned that most of the special features of the exhibit can and will be used again in other exhibitions and also that the Board will find further service for the sectional light-alloy structures as components for garages, workshops, etc.

★ ★ ★

As I have said on previous occasions, it is most difficult for the layman to understand apparent electrical vagaries. Recently a member of the Southern Electricity Consultative Council said that there was much discontent in rural areas because, while they could not get a supply of electricity, the Bournemouth sea-front was brilliantly illuminated. To the ordinary country dweller this must seem like cause and effect, of course.

★ ★ ★

In the Londoners' Diary of the *Evening Standard* last week, mention was made of a "plastic picture" measuring 6ft by 5ft and weighing between 3 and 4 cwt. This, it was stated was carved from "a black plastic called Tufnol, which is so hard that gear wheels are made from it for high-speed machinery." As it is said that a single curving line cost the sculptor a fortnight's work, it seems to me that he might have tried an easier medium.

★ ★ ★

It is a pleasant thing to see congratulatory messages from the editors of four "rival" electrical journals on the occasion of the 21st birthday of *Distribution of Electricity* in the July number of that excellent periodical. Sir Montague Hughman, chairman of Henley's, also conveys his felicitations, and Mr. J. S. Simmons, formerly editor, tells of the beginnings of *Distribution*. This issue contains a number of good articles, mostly of a technical character, and the whole is wrapped in a very attractive cover. Altogether the high standard which was set by the first issue has been well maintained, or even improved upon.

★ ★ ★

Practical views on the problem of providing electricity supplies in the Lake District were expressed at a recent meeting of the North Western Electricity Consultative Council. The feeling was that the effect of overhead lines on the beauty of rural landscapes is often exaggerated, and that by careful planning the lines need not seriously detract from the amenities of the area. To the people most intimately concerned—those who live in the area—it is of first importance that the tangible amenity of an electricity service should be made available at the earliest possible moment. A report of the North Western Electricity Board indicated that besides greatly increasing the cost, the general use of underground cables, involving in some cases tunnelling through solid rock, would mean that the schemes would take three times as long to complete.

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In an article on B.T.H. lamp production a writer in the *Illustrated Leicester Chronicle* says: "The name Mazda is in itself an extremely apt one, for in Greek mythology it was used to represent the God of Light." The Greeks had a word for it, but it wasn't this, I think.

Mining Exhibition

MACHINERY FOR USE UNDERGROUND DISPLAYED IN LONDON

THE collection of coal mining machines now on view at Earls Court is more comprehensive than any previously brought together in London, though not representative of all makes of this class of machinery. This trade show, which is not open to the general public, is "presented" by the Council of Underground Machinery Manufacturers and has been organized by the Engineering Centre, Ltd., of Glasgow.

The exhibition (7th to 16th July) was opened by Viscount Hyndley, chairman of the National Coal Board, and it coincides with the fourth Empire Mining and Metallurgical Congress which is being partly held in London.

Nine makers are showing heavy plant with lighter gear and accessories on twenty more stands. There are several diesel oil engines for haulage underground, but only one electric locomotive, which is shown by W. Neill & Son (St. Helens), Ltd., to demonstrate the ease of battery changing. The locomotive is drawn up between two "tables" (Fig. 1) on one of which is a set of 66 "Exide" cells in a steel plate container, which is pushed over rollers on to the locomotive while the discharged container is similarly rolled off on to the opposite table, on which is mounted the control gear for recharging the cells in position. This "permissible" 7-ton "Atlas" locomotive has two 17.5 h.p. motors, one driving each axle; the rated draw bar pull is 2,100 lb at 5 m/h. It is 11ft long and 4ft high.

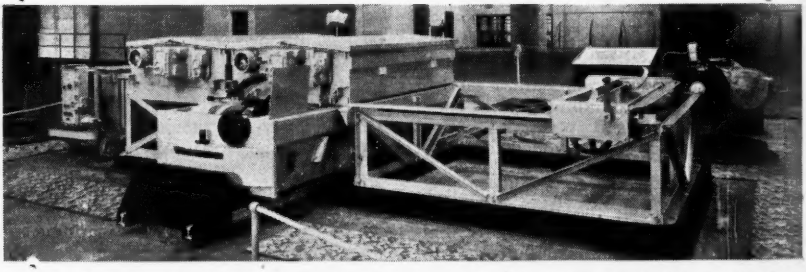


Fig. 1.—Flameproof 7-ton "Atlas" underground locomotive in battery-changing position—Neill & Son

Some forty items of Mavor & Coulson, Ltd., include conveyors, loaders, "Samson" coalcutters (Fig. 2) and the latest thin seam cutter, publicly shown for the first time. This a.c. 40 h.p. machine takes a kerf up to 6in and carries a spiral gummer, its overall height being 12in exactly. The haulage drum holds 90ft of 0.5in rope. One turn of the complete operating handle increases cutting speed from zero to full; reversing the handle provides slack rope. Fast speed for running out rope, or for flitting is provided for and can be stopped instantly by gentle pressure on the control handle. Like all long-wall Samsons, the cutter chain is engaged and disengaged from the haulage end and the jib is locked automatically so that no one need approach the gearhead during jibbing-in.

The range of M. & C. belt conveyor driving gears now includes the No. 4 (Fig. 3) which can transmit up to 125 h.p. at a belt speed of 450 ft/min, driven by a L.D.C. motor, 400 V three phase 950 r.p.m., all so nicely balanced on ball and roller bearings that the 3-ton gear can easily be turned by hand.

Apart from a selection of flameproof 5-15-20 h.p. induction motors the 12 and 15in chain long-wall, under and over cutters of British Jeffrey-Diamond, Ltd., include a curved jib type (Fig. 4) and the "Ace" ranging machine. The telescopic 61-CLR conveyor loader (Fig. 5) for room and pillar work and heading development is the first of its kind to be exhibited in Britain and differs in principle from most others. It is specially suited to the thinner seams, gathers coal from the full width of face and to the full depth of cut, the discharge end being anchored above the receiving conveyor to avoid spillage, so the latter does not have to be watched by the operator who rides the machine, and moves it from one working place to another under its own power. One 20 h.p. electric motor drives

the gathering and conveying chains direct and provides hydraulic power for the other two operations. Two front wheels are used for driving and the rear two for steering; all four have pneumatic rubber tyres. The telescopic gathering head can be extended 12ft in search of loose coal and to break down standing coal. It can be raised 12in to collect from the top of a pile and be depressed 6in below floor level to follow irregularities in the surface. This loader will operate in seams as low as 36in and move 1-5 tons/min. It is 6ft wide, 23ft 7in long, 24in high and weighs 6 tons 2 cwt.

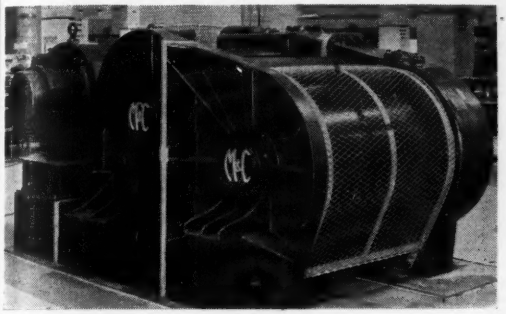


Fig. 2 (above).—Jib-chain "Samson" coal cutters. Fig. 3 (left).—Double-roll 3-ton 125 h.p. gear for conveyor driving — Mavor & Coulson

In addition to flameproof gate-end circuit breakers, plugs and sockets, conveyors, loaders and coal-cutters, Anderson, Boyes & Co., Ltd., developed the Meco-Moore cutter-loader which cuts and loads the coal in one operation, thus enabling not only the fillers but also the normal cutting, hole-boring and shot-firing crews to be dispensed with. The latest type, only 2ft high, will work in the thinner as well as thicker seams. Cutting speeds reach up to 30 in/min with double rope haulage, controlled and protected by a multiplate friction clutch within the gear case. Above the latter is an air duct intake for cooling the twin a.c. driving motors, each of 60 h.p. of the sleeved stator construction and interchangeable, in a single casting. One drives two horizontal cutting chains and the haulage unit, while the other operates the loader, shear jib and gummers.

The telescopic turret over-cutter is claimed to have been first introduced by Cowlishaw, Walker & Co., Ltd., for roof forming operations. This firm

Fig. 4 (above).—Coal cutters, showing curved jib in foreground

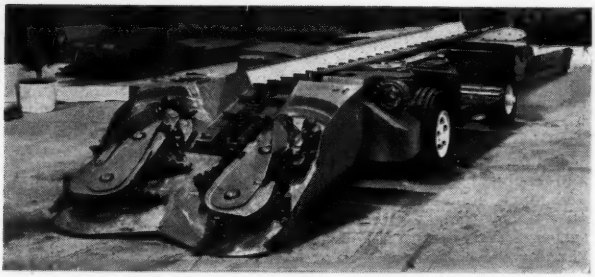


Fig. 5 (right).—Telescopic conveyor loader on pneumatic wheels—British Jeffrey-Diamond

is said to have introduced the double drive chain conveyor to the British mining fields. All components are standard to general scraper-chain work; the relatively smaller driving unit required makes handling easier, increases permissible length and reduces chain tension. The latest design of trunk conveyor for 30 or 36in belts is of 75 h.p. with remote delivery driving unit to which the motor may, if desired, be coupled through a fluid drive to improve starting and render control more flexible.

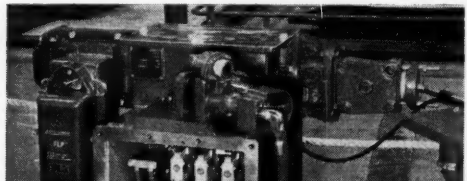


Fig. 6.—Aluminium alloy room switch of light weight—M. & C. Switchgear

A working trough belt conveyor installation demonstrated by the Distington Engineering Co., Ltd., has a fluid coupling and electro-mechanical brake. There is also a working shaker conveyor and duckbill installation with accessories.

One of the most recent types of top loading face conveyor is made by the Mining Engineering Co., Ltd., to work in conjunction with the Anderson Boyes cutter-loader; also electric shaker engines and an improved 5 h.p. electric fan for inbye ventilation.

Among control gear made by M. & C. Switchgear, Ltd., is a room switch for 80 A at 660 V (Fig. 6) designed for mechanized room and pillar work. The flameproof enclosure contains the isolator, contactor, over-current trips and control relay for electrically interlocking trailing cables. It is made of aluminium alloy and weighs 230 lb in contrast to nearly 5 cwt of the cast iron equivalent. Some plugs, sockets and couplers are also being made shorter and much lighter by the use of that alloy; they range from 15 to 100 A at 660 V and include a 15 A pilot cable coupler. A gate-end for the control of distant coal cutters and conveyors has a pilot circuit that is certified intrinsically safe. Various kinds of sequence control is obtainable with the "Sentryfugue" switch, which is simple mechanically and needs only one direct drive. It is mounted on the conveyor and is operated by rise and fall of the belt speed, an associated relay stopping the motor in the event of belt slip or breakage.

The coal cutter made by Siskol Machines, Ltd., is driven by a 5 h.p. motor and is provided with an attachment for flexible shaft drilling in development and similar narrow work.

Flameproof drills for shot-firing purposes made by Siemens-Schuckert (Great Britain), Ltd., are hand-held rotary machines (Fig. 7) but a mechanical feed attachment with an adjustable stand and an electric drifter are available for hard stone drilling. A gate-end box is unusual in that the cover is secured without bolts. Flameproof transformer panels and distribution boards for mine lighting are also produced.

Rotary drilling equipment is a speciality of Victor Products (Wallsend), Ltd., while more recently a range of lighting fittings has been marketed, designed on the plug-in "unit" system for ease of installation at the pit bottom, in roadways and at the coal face.

In addition to drilling machines and drill panels incorporating mercury switches, a range of 30 to 100 A flameproof plugs, sockets and couplers for trailing cables is available from Hugh Wood & Co., Ltd., as well as conveyors and loaders. Conveyor driving heads made by Richard Sutcliffe, Ltd., range from 15 to 200 h.p. Electric jigger conveyors are manufactured by the Uskside Engineering Co., Ltd., while scraper haulage gear and electric hoists are being shown by Austin Hopkinson & Co., Ltd.

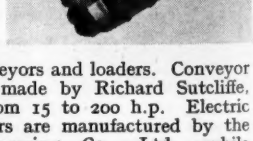


Fig. 7.—Flameproof drill for shot holes in coal and stone—Siemens-Schuckert

The tunnelling equipment of Eimco (Great Britain), Ltd., which is now being made in this country, can be "hydra-electric" and made flameproof if desired in track or trackless types.

PARLIAMENTARY NEWS

By Our Special Reporter

THE Minister of Labour (Mr. Isaacs), in a written reply to Mr. S. P. Viant, last week, said that steps must again be taken in the coming winter to reduce the load on the power stations during the peak periods in the morning and evening.

The Electricity Sub-Committee of the National Joint Advisory Council had recommended that the same general administrative arrangements made last winter should be repeated. It had been found possible to recommend some easement in the contribution asked of industry. During December, January and February industry would be asked to cut its maximum peak demand on Mondays to Fridays inclusive by 20 per cent during the hours of 8 a.m. to 10 a.m., but during the hours of 10 a.m. to 12 noon the reduction asked for would be only 10 per cent. From 1st December until 15th January a reduction of 20 per cent would also be necessary between the hours of 4 p.m. to 5.30 p.m. on Mondays to Fridays inclusive. After that date the problem of the afternoon peak should be left to the discretion of the Regional Boards. It would be necessary for the Regional Boards to ask some firms in appropriate cases to make an extra reduction in respect of their particular loads, but it was not intended that the general figure of 20 per cent should be exceeded over large areas.

Other classes of consumers must also make a contribution proportionate to their demand, and it had therefore been decided that, as last winter, commercial consumers, including shops, offices, warehouses, hotels and cinemas, should be brought within the scope of the arrangements made by the Regional Boards for Industry and that they should be required to reduce their consumption by the same amounts and during the same hours. The Ministry of Fuel and Power and the British Electricity Authority with the Area Boards would also take appropriate steps to ensure that domestic consumers and small commercial consumers exercised the fullest economy in the use of electricity during peak hours.

Admiralty Engineers

Mr. Medland asked the Parliamentary Secretary to the Admiralty what was the number of naval officers employed in the Superintending Electrical Engineering Departments at the Admiralty, the Royal Dockyards and on overseeing duties in industrial establishments in the United Kingdom respectively; and to what extent it was the policy of the Admiralty to increase the number of naval officers employed in these departments to supersede civilians.

Mr. W. J. Edwards said that as regarded the first part of the question, the answer was none in the Department of Electrical Engineering of the Admiralty, one in the Dockyard Department headquarters, twelve in home yards and eight on overseeing duties. As regarded the second part of the question, as a corollary to the introduction of the Electrical Branch into the Royal Navy much of the professional work at present allocated to civilian electrical engineers would eventually be performed by naval officers. He was unable at present to say precisely how far this process would go because that question was under discussion with the staff side; but the naval proportion would probably be about two-thirds when the process was completed several years hence.

Television in East Midlands

Mr. Sidney Shephard asked the Postmaster General if he could state when television services would be provided in the East Midlands area.

Mr. Paling said that the B.B.C. hoped that a television station would be working at Sutton Coldfield in the late autumn. It was expected that the range of the station would be about 50 miles and that satisfactory service might be obtainable in favourably situated places outside the normal range. The station would, therefore, provide a television service in part of the East Midlands area.

Scottish Electricity

During a debate on the Scottish Estimates, Commander Galbraith asked about the progress of electrical development in the Highlands. He said that the rehabilitation of the Highlands depended on the North of Scotland Hydro-Electric Board making a profit out of the sale of electricity. The success of many new projects which they hoped would be set up in the development areas on the Cromarty Firth depended on cheap electricity. In view of the enormous increase in cost over the estimated cost of the schemes which were now in process of construction, would it be possible to make a profit and to have cheap electricity? This was a source of worry to all who took an interest in Scotland, and the worry was in no way dissipated by the annual report of the North of Scotland Hydro-Electric Board. That was a most extraordinary document; it showed nothing of how the

programme was going. But what it lacked in matter it made up in art. What benefit would come from all the expenditure of money on it?

Mr. Woodburn, the Secretary of State for Scotland, said the report was printed by private enterprise. It might be private enterprise which persuaded the Board to go in for art instead of the usual type of Government report. So far as the timetable of developments was concerned, they were extremely hopeful. At the moment there was the distinct prospect, in spite of the difficulties of the time, of starting two of the main electric schemes before the end of the year.

Differential Tariff Decision

Replying to Mr. E. Davies, Mr. Gaitskell said that he had now been informed by the British Electricity Authority and the Area Boards that they did not favour the continuance of the differential tariff next winter, and in this they were supported by the majority of the Electricity Consultative Councils and by the Electricity Sub-Committee of the National Joint Advisory Council. In view of this advice, of the fact that the tariff was regarded by many as harsh and unfair in its incidence and of the absence of cogent evidence that it exercised a sufficiently decisive influence on peak demand, he did not propose to ask the Electricity Boards to continue it next winter. He must, however, warn the House that the gap between generating capacity and peak demand was unlikely to be much less next winter than last; and domestic consumers must therefore limit their demand during peak hours in cold weather.

Mr. Gaitskell said that it would be impracticable to consider the refund of charges where they could be shown to have been a hardship to people living in all-electric houses.

Bankside Power Station

Regarding progress in the erection of the new Bankside power station Mr. Gaitskell said he was informed by the British Electricity Authority that part of the foundations were now completed and that the erection of the steelwork of the main building would start in the autumn. Experiments had confirmed that noxious sulphur fumes could be eliminated, but there was the question of the cost involved and which of two methods was the better.

Underground or Overhead?

Mr. Granville Sharp asked the Minister of Fuel and Power if he would make a statement as to the instructions he had given or proposes giving to the British Electricity Authority for the laying of underground cables instead of overhead transmission lines in National Park Areas of exceptional beauty; and whether the additional cost of such work would be met by the British Electricity Authority or by the planning authority concerned.

Mr. Gaitskell said that since his consent was required before any overhead line could be erected anywhere and since before such consent was given he had to grant the local planning authority and the local authority an opportunity of stating their views, instructions of this kind would not be appropriate. The extra cost involved in laying underground cables would fall on the Electricity Board concerned. The cost of underground cables was about ten times as much as overhead lines.

London Metal Exchange

Mr. George Strauss, Minister of Supply, said he had carefully considered commercial and industrial representations on the advantages of re-opening the London Metal Exchange, in particular the hedging facilities which this would provide. It was, however, generally accepted that a free market in non-ferrous metals would have to be severely restricted to prevent a loss of our dollar resources and he was convinced that these limitations, if they were to be effective, would so restrict the freedom of the market as largely to nullify the benefits which its advocates desire to bring about. Even more important, the abandonment of bulk buying of these commodities from Commonwealth countries would seriously endanger our supplies from these sources and make us more dependent on dollar purchases. For those reasons he was at present unable to agree to the re-opening of the Metal Exchange for the purchase and sale of copper, lead and zinc. Other considerations applied to tin, which was now the subject of international discussion.

CORRESPONDENCE

Unsafe Installations

THE old subject of "shoddy" work is in the headlines again, and the old fighter Alex Milne is still hammering away.

If anybody were to visit some of the houses in this part of London and see the variations of "fire-inviting" installations, he would have a rude shock. In the first place, contractors should note the conditions and report to installation inspectors, who should give 24 hours' notice and then cut off the supply. Make it safe—one way or another.

London. J. SCOTT.

National Supply Survey

ELECTRICAL ASSESSMENT OF THE FOURTEEN AREAS

2. LONDON AREA

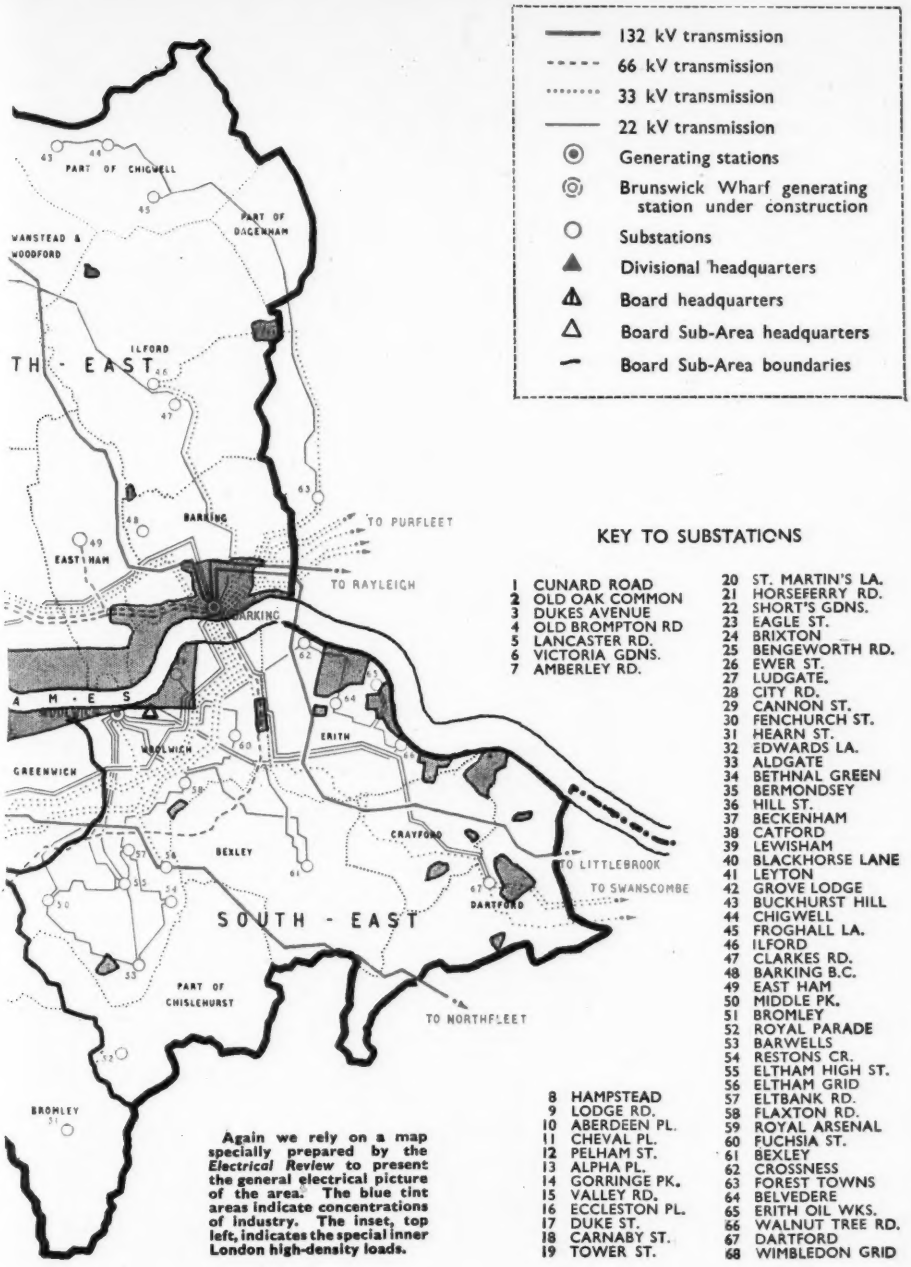
IN extreme contrast to the South-Western Area, which we dealt with in our issue of 10th June, the London Area is by far the smallest geographically, having an extent of only 257 sq miles, as against the 5,500 sq miles of the South-Western Area and the 7,870 sq miles for the largest of all the Areas, the Eastern. Superficially, no doubt, the London Area is the easiest to characterize, and from the widest viewpoint it is probably not necessary to do more than to mention such names as St. Paul's Cathedral, Westminster Abbey, the Houses of Parliament, Buckingham Palace, Battersea Generating Station, the Tower of London, London Docks and Trafalgar Square. Again we rely mainly on a specially prepared map to present the general electrical picture of the Area, and because of the density of population referred to there is the unique feature that major transmission is mainly carried out by 132 kV and 66 kV underground cable, as distinct from overhead line. London is the only Area which, in its entirety, with the exception of its notable and extensive parks, is shown by the Land Utilization Survey of 1931-1939 as entirely "chief urban." It is also shown by the Ministry of Town and Country Planning maps to be the only Area which is practically entirely "urban" and "dense urban," i.e., the population overall is more than 24,000 per sq mile.

These density figures have electrical reflections which it is as well to deal with at this stage before turning back again to the general character of the Area. This smallest Area has the largest generating capacity of any, the thirty generating stations within it having an aggregate installed plant capacity of 2,684 MW. The kWh sold in the last year before vesting date was 3,380 million, as against 2,925 million for the largest Area physically, while the population of 6.2 million represents 1.50 million consumers. The corresponding figures for the largest Area, however, are comparable rather than contrasting, i.e., 4.7 million population and 1.18 million consumers. The Area is crudely oblong with roughly equal proportions north and south of the Thames and extending from Dartford in the east to Barnes in the west.

The following undertakings were vested

Battersea power station, seen above, has the largest turbo-alternator on one shaft (105 MW) in the country

HOLBORN
CITY OF LONDON
WESTMINSTER
KENSINGTON
CHELSEA
Shopping
Newspapers
Clubland
Theatres
Restaurants and hotels
Domestic
Commercial
TO BRIMSDOWN
EASTERN
TO FINCHLEY
TO HORNSEY
NOR
STONEBRIDGE PARK
TO WATFORD
TO UXBRIDGE
HAMPSTEAD
TAYLORS LANE
NORTH - WEST
ACTON LANE
ST. PANCRAS
GROVE ROAD
ISLINGTON
HACKNEY
NORTH
SHOREDITCH
BETHNAL GREEN
PADDINGTON
ST. MARYLEBONE
STEPNEY
POPLAR
WEST
HAMMERSMITH
KENSINGTON
CHELSEA
WESTMINSTER
BANKSIDE
BERMONDSEY
SOUTHWARK
BLACKWALL POINT
E. & W. DEPTFORD
DEPTFORD
FULHAM
BATTERSEA
LOMBARD ROAD
LAMBETH
CAMBERWELL
BARNES
WANDSWORTH
SOUTH - WEST
WIMBLEDON
LEWISHAM
SOUTH
PENGE
MITCHAM
MALDEN & COOMBE
MERTON & MORDEN
PART OF BECKENHAM
TO KINGSTON
TO LEATHERHEAD
SOUTH - EASTERN
TO BEDDINGTON



KEY TO SUBSTATIONS

1 CUNARD ROAD
2 OLD OAK COMMON
3 DUKES AVENUE
4 OLD BROMPTON RD
5 LANCASTER RD.
6 VICTORIA GDNS.
7 AMBERLEY RD.
8 HAMPSTEAD
9 LODGE RD.
10 ABERDEEN PL.
11 CHEVAL PL.
12 PELHAM ST.
13 ALPHA PL.
14 GORRINGE PK.
15 VALLEY RD.
16 ECCLESTON PL.
17 DUKE ST.
18 CARNABY ST.
19 TOWER ST.
20 ST. MARTIN'S LA.
21 HORSEFERRY RD.
22 SHORT'S GDNS.
23 EAGLE ST.
24 BRIXTON
25 BENGEWORTH RD.
26 EWER ST.
27 LUDGATE.
28 CITY RD.
29 CANNON ST.
30 FENCHURCH ST.
31 HEARN ST.
32 EDWARDS LA.
33 ALDGATE
34 BETHNAL GREEN
35 BERMONDSEY
36 HILL ST.
37 BECKENHAM
38 CATFORD
39 LEWISHAM
40 BLACKHORSE LANE
41 LEYTON
42 GROVE LODGE
43 BUCKHURST HILL
44 CHIGWELL
45 FROGHALL LA.
46 ILFORD
47 CLARKES RD.
48 BARKING B.C.
49 EAST HAM
50 MIDDLE PK.
51 BROMLEY
52 ROYAL PARADE
53 BARWELLS
54 RESTONS CR.
55 ELTHAM HIGH ST.
56 ELTHAM GRID
57 ELTBANK RD.
58 FLAXTON RD.
59 ROYAL ARSENAL
60 FUCHSIA ST.
61 BEXLEY
62 CROSSNESS
63 FOREST TOWNS
64 BELVEDERE
65 ERITH OIL WKS.
66 WALNUT TREE RD.
67 DARTFORD
68 WIMBLEDON GRID

Again we rely on a map specially prepared by the *Electrical Review* to present the general electrical picture of the area. The blue tint areas indicate concentrations of industry. The inset, top left, indicates the special inner London high-density loads.

in the London Electricity Board upon nationalization:—

Municipal Corporations — Barking, Barnes, Battersea, Beckenham, Bermondsey, Bexley, Bethnal Green, Bromley, Dartford, East Ham, Erith, Fulham, Hackney, Hammersmith, Hampstead, Ilford, Islington, Leyton, Poplar, St. Marylebone, St. Pancras, Shoreditch, Southwark, Stepney, Stoke Newington, Walthamstow, West Ham, Willesden, Wimbledon, Woolwich.

Companies—Central London Electricity, Ltd.; Chislehurst Electric Supply Co., Ltd.; City of London Electric Lighting Co., Ltd.; County of London Electric Supply Co., Ltd.; Foots Cray Electricity Supply Co., Ltd.; London Electric Supply Corporation, Ltd.; London Power Co., Ltd.; Notting Hill Electric Lighting Co., Ltd.; South London Electric Supply Corporation, Ltd.; and South Metropolitan Electric Light & Power Co., Ltd.

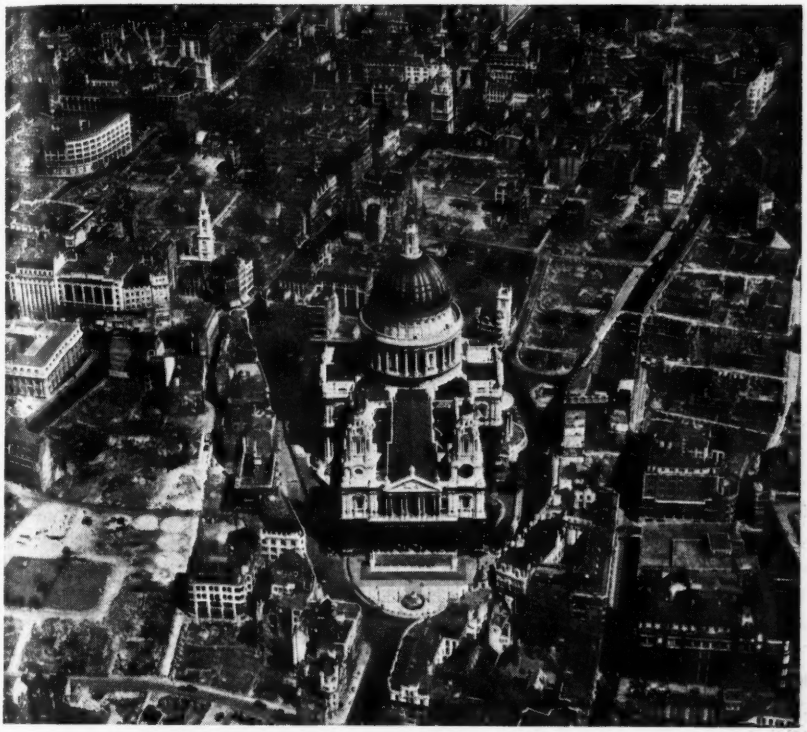
Analysis of Load

Taking the Area as a whole, a rough load analysis is as follows:—Domestic supply, 45 per cent (1.3 million consumers); industrial supply, 30 per cent (0.03 million consumers); commercial supply, 22 per cent (0.16 million consumers); and public lighting and traction supply, 3 per cent. This analysis gives quite a good second place to industrial supplies, but this does not help in truly characterizing the Area, the estimated m.d. for which is 1,260,000 kW. In saying this we have in mind that there is about eight square miles round about the City, Holborn and Westminster, where general and electrical densities cannot be embraced in any statement which refers to the London Area as a whole, but which plays an outstanding part in the character of the Area. This part of London includes the dense commercial area in the East, the central area where London entertains and accommodates its visitors, and the western section where the Central Londoner and his family live.

Central Concentration

We have referred to the total population of the Area as 6.27 million, representing about 0.024 million per square mile, but the smaller area of which we have just spoken throws up a sharp contrast to this. The permanent population in this smaller district must be comparatively small; but by virtue of the very large morning influx of workers who fill the offices, and the large numbers of visitors who are continually coming and going, there is a daytime population of about one million, at a very rough estimate. When these workers leave their offices the influx of visitors to the cinemas, theatres, hotels, restaurants and clubs affords an evening population also of about one million. Thus we see that for this small but highly significant inner area the industrial load is negligible, while the commercial, entertainment, shopping and domestic populations, consumers and loads represent high densities probably incomparable with others anywhere else in the world and certainly with anywhere else in this country. The commercial premises range from the single-room offices in many parts of the City and surrounding area to the large modern office blocks of which Shell Mex House and Bush House are prominent examples. Olympia and Earls Court are among the exhibition halls which boost in no small way the entertainment load. Within one square mile there are thirty-four leading

The Houses of Parliament seen from the south side of the River Thames



Looking eastwards across the city with St. Paul's Cathedral dominating the picture (*Aerofilms Photo*)

theatres with a total seating capacity of 46,000. The mere mention of a few world-known stores like Harrods, Barkers and Selfridges, a few widely known large blocks of flats like Dolphin Square, Kensington Close and Thackery Court, and some hotels like the Dorchester, Savoy and Cumberland complete the picture of intensity and density which characterizes this inner area.

Despite these unparalleled concentrations of a few types of consumers and load in a specific part of the Area, however, almost every type of consumer is represented in the Area as a whole, and there are even a very few small farms on the outskirts.

Again, referring to the Area as a whole, the 30 per cent industrial load is a pretty formidable figure. It is not practicable to classify this industry which can perhaps best be described as a mixture of light engineering and production lying on a strip about the Thames from, say, Bermondsey to Barking. Apart from patches distributed about the whole of the Area this strip may be referred to as the only section of industrial concentration.

Large Industrial Concerns

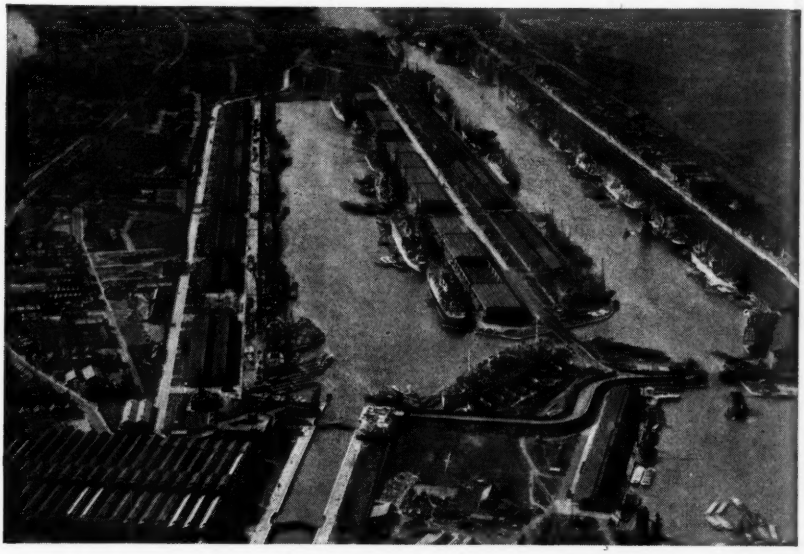
The following notes relating to a few selected large industrial consumers will help to characterize the area in illustrating the diversity referred to.

The new flour mill of the Co-operative Wholesale Society at Victoria Docks has, at present, a capacity of 320 bags per hour, but the ultimate designed production figure is 600 bags per hour. The

present annual consumption is about 10.5 million kWh, with a m.d. of 2,500 kVA, but it is anticipated that when the mill is fully developed the m.d. will approach 5,000 kVA and the consumption will rise to 25,000 kWh per year.

Associated Newspapers, Ltd., print and publish in the Fleet Street area over 1,000 million newspapers each year, for a consumption of about 2.75 million kWh. The normal daily m.d. is about 600 kW. Apart from the actual press drives, including such auxiliaries as reel changing, counting and conveying, electricity is also used widely in the foundries and the composing rooms and kitchens as well as for telegraphy and radio communication, including photo-telegraphy.

At their factory at Woolwich Siemens Bros. & Co., Ltd., manufacture, *inter alia*, telecommunication equipment, cables, joint boxes and overhead line materials. Their consumption and m.d. last year were 8,646,700 kWh and 2,980 kW respectively. J. Stone & Co., Ltd., have an engineering works at Deptford where they manufacture railway lighting and air-conditioning equipment. They were responsible for such equipment on the Royal train on which their Majesties toured South Africa, and they cast the propellers for the liners *Queen Elizabeth* and *Queen Mary*. Last year's consumption and m.d. were 2,867,000 kWh and 972 kW, respectively.



Docks form an important feature of the Area: King George V, Royal Albert, and Royal Victoria docks are seen above (*Aerofilms Photo*)

At Carreras, Ltd., St. Pancras, about 1,000 motors ranging from $\frac{1}{8}$ h.p. to 100 h.p. are employed on individual drives in the production of tobacco and cigarettes, consuming about 4 million kWh per year, with a m.d. of 1,200 kW. Most of the motors, however, are of 2 to 3 h.p. and sequence controlled. The Morgan Crucible Co., Ltd., has a factory in Battersea where it manufactures crucibles and crucible furnaces, refractories and ceramic products, carbon brushes, arc-lamp carbons and various carbon and graphite articles. Motor drives and furnace heating are mainly responsible for an annual consumption of 10 million kWh, with a m.d. of 2,230 kW.

Large consumers in the public services group include London Transport Execu-

tive, Port of London Authority, London County Council, Metropolitan Water Board and many Government offices in the Whitehall district.

To meet the above exceptional conditions there has been built up over the years electrical organizations which have now to be handled by the Board and Division, generating stations, transmission and distribution systems, showrooms, service centres and offices, consumers and consumers' conditions, all of which we shall try to weld into this survey in a readily understandable way. Before presenting a list of the generating stations, however, we will refer to the following points of outstanding interest. Twelve of the thirty generating stations are riverside ones which use the Thames water for condenser cooling, while the Thames is also used extensively for coaling.

Present and Projected Plant

Barking power station has the largest installed capacity (522 MW) in the country, while at Battersea there is the largest turbo-alternator on one shaft (105 MW) in the country. At 26.76 per cent thermal efficiency for 1948 Fulham power station was responsible for yet another record in the area. The thirty generating stations are scheduled on this page, and with one exception, namely, Shorts Gardens, which is diesel operated, they are all steam driven.

The following generating plant is at present under construction, either by way of new stations or extensions: Bankside 112 MW, Barking "C" 211 MW, Battersea 167 MW, Blackwall Point 84 MW, Brunswick Wharf 200 MW, Deptford East 100 MW, Fulham 56 MW, Hackney 28 MW, West Ham 113 MW, and Woolwich 29 MW. Bankside, Barking "C," Blackwall Point, Hackney and West Ham are all completely new stations in the strictly physical sense, but as these stations are on the sites of, or adjacent to, existing stations, only one new station appears on the map, i.e., Brunswick Wharf, which is being erected on an entirely new site.

About 7,952 million kWh was generated by the power stations during the year 1947, and of this figure 245.5 million kWh represented generation at 25 cycles. In addition 99.8 million kWh was purchased from the following authorities who have their own private generation plant: Fords, Ltd., London Transport Executive, and Railway Executive, London Midland region. Of

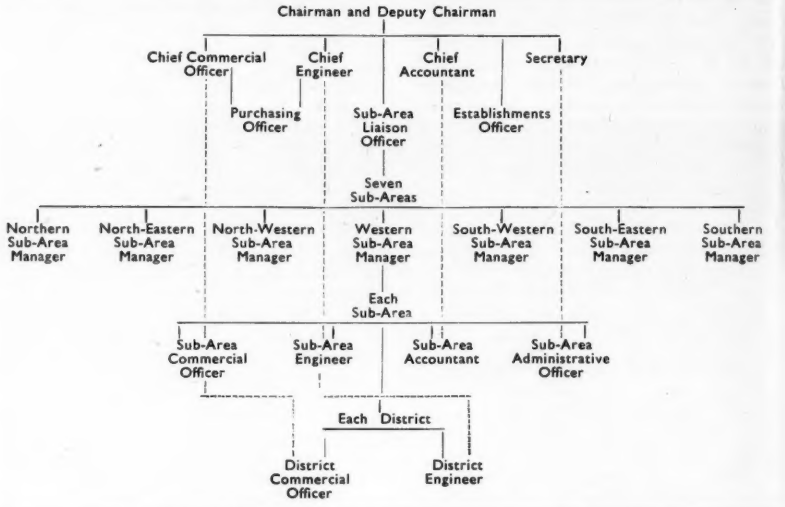
Station	Former Owners	Installed plant cap. M.W.*	Effective sent out cap. M.W.*	Method of Operation
Acton Lane	London Power Co.	162	154	3-shift
Bankside	City of London Elec. Lighting Co. Ltd.	89	76	2-shift
Barnes	Barnes Corporation	7	6	2-shift
Barking "A" and "B"	County of London Elec. Supply Co. Ltd.	522	479	3-shift
Battersea	London Power Co. Ltd.	345	299	3-shift
Beckenham	Beckenham Corporation	5	4	2-shift
Bow	London Power Co. Ltd.	51	48	2-shift
Deptford East	London Power Co. Ltd.	151	139	3-shift†
Deptford West	London Power Co. Ltd.	222	208	3-shift
Fulham	Fulham Boro' Council	300	282	3-shift
Grove Road	London Power Co. Ltd.	80	57	2-shift
Hackney	Hackney Boro' Council	91	88	2-shift
Hammersmith	Hammersmith Boro' Council	20	18	2-shift
Ilford	Ilford Boro' Council	3	3	2-shift
Islington	Islington Boro' Council	24	20	2-shift
Lombard	Battersea Boro' Council	50	43	2-shift
Poplar (Glaucus St.)	Poplar Boro' Council	15	10	2-shift
Poplar (Watts Grove)	Poplar Boro' Council	25	24	2-shift
St. Marylebone	St. Marylebone Boro' Council	47	40	2-shift
St. Pancras	St. Pancras Boro' Council	49	26	2-shift
Shoreditch	Shoreditch Boro' Council	25	18	2-shift
Short's Gardens	Central London Elec. Ltd.	3	3	2-shift
Southwark	Southwark Boro' Council	6	3	2-shift
Stepney	Stepney Boro' Council	81	65	2-shift
Taylors Lane	Northmet Power Co.	77	71	3-shift
Walthamstow	Walthamstow Corporation	19	13	2-shift
Wandsworth	County of London Elec. Supply Co.	22	15	2-shift
West Ham	West Ham Corporation	66	54	2-shift
Wimbledon	Wimbledon Corporation	25	19	2-shift
Woolwich	Woolwich Boro' Council	102	97	2-shift

* Values given to nearest megawatt. † 25-cycle plant—railway supply.

Details relate to the position at 1st January, 1949.

the 8,000 million kWh represented by the above generation and purchase it is estimated that 5,700 million kWh was sold to supply authorities inside the Area and the railways and that 2,270 million kWh was exported via the grid. The sum of the non-simultaneous maximum outputs of all the power stations for the same year (1947) was 2,135,300 kW, while the non-simultaneous m.d.s taken from the three outside bodies referred to above 65,000 kW.

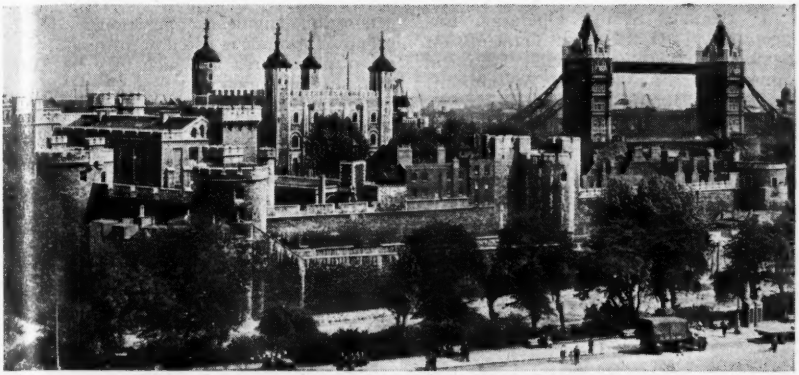
The forty supply undertakings which existed in the Area before nationalization represented about 1.5 million consumers who were catered for by over 70 service centres. These customers, who were responsible for a consumption of 3,380 million kWh during the year ending 31st March, 1948, can give an approximate indication of the variations in the load concentration. For the whole area the concentration is 5,843 consumers per 1 mile. The corresponding figures for



The London Electricity Board organization is depicted by this tree

CHIEF OFFICERS OF THE LONDON ELECTRICITY BOARD

Left to Right: Messrs. R. Reynell (establishments officer), H. J. Mellows (chief accountant), E. A. Mills (deputy chairman), F. C. Fenton (chief commercial officer), H. J. Randall (chairman), W. H. Warhurst (secretary) and D. B. Irving (chief engineer)



The Tower of London with Tower Bridge to the right

the seven Sub-Areas are as follows: Western, 13,733; North Western, 9,330; Northern, 11,625; North Eastern, 4,156; South Eastern, 2,301; Southern, 5,291; and South Western, 5,259. Such variations in load concentrations may be partly responsible for the extraordinary diversity of tariffs, but in any case a summary of the latter must be given to help complete the picture we are trying to present. Before vesting day the different rates listed on published tariff sheets numbered 270, and some idea of the variations can be obtained from the facts that lighting rates ranged from 6.5d down to 2.5d, while the running charges for domestic two-part tariffs varied from 1.1d to 0.5d.

With its home at 46-47, New Broad Street, E.C.2, the earlier headquarters of the former County of London Electric Supply Co., Ltd., the London Electricity Board is now one of the two organizations directly responsible for the electricity supply in the area. The organization set up or being set up by the Board is indicated in the tree diagram on page 110. The following are the principals and chief officers: Chairman, Mr. H. J. Randall; Deputy Chairman, Mr. E. A. Mills; Chief Commercial Officer, Mr. F. C. Fenton; Chief Engineer, Mr. D. B. Irving; Chief Accountant, Mr. H. J. Mellows; Secretary, Mr. W. H. Warhurst.

The other organization, i.e., the London Division of the B.E.A., is installed at Ergon House, Horseferry Road, which was formerly the headquarters of the London Power Co., Ltd., and is under the direction of Mr. J. N. Waite, Divisional Controller. Mr. Waite's principal officers are: Chief Generation Engineer (Construction), Mr. A. Pollitt; Chief Generation Engineer (Operation), Mr.

LONDON DIVISION OFFICERS

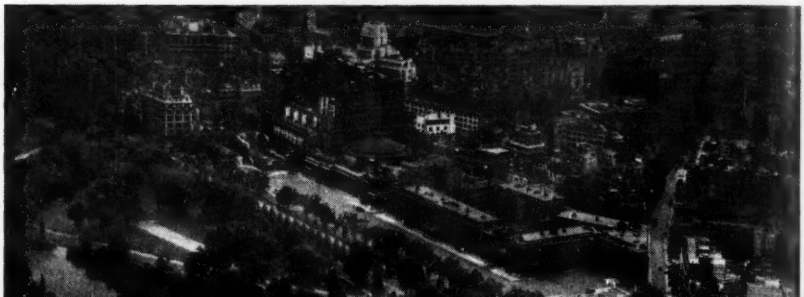
Left to Right: Messrs J. G. Bentley (system operation engineer), H. R. Hornby (accountant), B. Higgins (secretary), J. N. Waite (controller), A. Pollitt (chief generation engineer—construction), H. J. Bennett (chief generation engineer—operation), J. Williams (technical engineer) and B. Farnworth (transmission engineer)

H. J. Bennett; System Operation Engineer, Mr. J. G. Bentley; Transmission Engineer, Mr. B. Farnworth; Technical Engineer, Mr. J. Williams; Accountant, Mr. H. R. Hornby; Secretary, Mr. B. Higgins.

The Generation Construction Department is responsible for the construction of new generating stations and the extension of existing ones. Within the department are a number of construction engineers, each being responsible for the work at a number of new stations or extensions. In addition there are specialists who deal with particular aspects of the design and construction of the new plant.

The Generation Operation Department is arranged in groups, each group being under the supervision of an operation engineer directly responsible to the chief generation engineer (operation). Each group of stations is listed according to the geographical area in which they lie, and the superintendent at each station is responsible to the group operation engineer. This department also has specialists.

The System Operation Department is responsible for the operation of the grid system and the associated generating stations in the St. Paul's grid control area. This area comprises the London, South Eastern and Eastern Divisions, as well as a part of the Southern Division (see map in *Electrical Review*, 3rd June). There are two control centres, the main one being in King Edward Street, near St. Paul's Cathedral, and the other at Ergon House. The Transmission Department is responsible for the construction and maintenance of the transmission network and associated substations of the



Looking south-east towards Victoria and Westminster with Buckingham Palace, seen from the rear, in the foreground (*Aerofilms Photo*)

Division, while the Technical Department is concerned with planning and development, protective gear commissioning and maintenance, metering and communications, and with technical problems generally associated with generation and transmission.

The very high population density which we stressed at the beginning of this article presents very special problems in regard to future development. Land is not available for extensive domestic and industrial buildings, so that re-development is likely to take the form of buildings of increased heights which, in turn, means even greater load concentration. There is a large field in the outer ring, however, where there is less density and congestion, in which the electrification of many light-industry factories is likely to increase materially. Before 1939 shop-window and sign lighting constituted an important part of the London load, but with the lifting of restrictions on this form of lighting, and development of electrical equipment, this field has an even greater promise.

We are indebted to Mr. H. J. Randall, Chairman, London Electricity Board, and to Mr. J. N. Waite, Controller, London Division, B.E.A., for their co-operation in making it possible for us to prepare this article, and to some of their principal officers and assistants for their help in obtaining the information we have given.

Trends in the United States

ADVANCES IN POWER STATION PRACTICE

IN commemoration of its 75th year of publication the *Electrical World*, which is thus two years younger than the *Electrical Review*, has issued a special number surveying the technical advances in electricity supply in the United States during the past quarter of a century. In this it is shown that industry there now consumes more than half of the total electrical output, yielding about one-third of the total revenue. Of the 7½ h.p. used per worker, over nine-tenths is electric.

For steam raising in the larger boilers automatic combustion control is regarded as almost indispensable. Acid cleaning of long and bent boiler tubes (straight tubes no longer being used for high pressures) is standard practice. In several new stations steam temperatures of 1,050 deg F have been adopted. With the increased cost of coal reheating up to 1,000 deg F is found economical, especially for the "unit" principle of one boiler for each turbine.

Turbines rated at 100,000 kW at 3,600 r.p.m. are in operation, a few with triple exhausts having 23in last-row blades. Each 25 deg F increase in temperature decreases the heat rate by 0.75 per cent. Generally carbon steel is used up to 825 deg. 1 and 2½ per cent chrome-molybdenum for 950 and 1,000 deg respectively and 18-8 stainless steel for 1,050 deg. Austenitic alloys are under test up to 1,600 deg F and pressures of from 1,800 to 2,400 lb/sq in will probably come into more frequent use.

For adjustable-speed auxiliary drives, squirrel-cage induction motors with electrical or mechanical variable-speed couplings or, for fans, with vane control are usually adopted. For supplying auxiliaries a generator on the main shaft in association with system transformers appears to be the commonest arrangement. Shaft-driven exciters at the high speeds of modern large units are regarded as unreliable by many operators, who prefer motor-driven units, some with flywheels, with voltage-regulation of the Amplidyne or Rototrol types. Exciter voltages of 375 V or more are expected to become general. More use of high-pressure hydrogen cooling of alternators (up to 30 lb/sq in) is expected.

Voltages higher than the 220 kV used in some cases at present for transmitting bulk loads are likely to be adopted for lines superimposed on existing 132-kV systems which tend to act as distributors. Corona and other factors at 265 to 500 kV are being investigated. All maintenance and repair work (including insulator replacements) on 220 kV systems is carried out with the lines energized. For insulator washing water is pumped at 800 lb/sq in through a $\frac{3}{16}$in nozzle. Helicopters equipped with two-way radio have been successfully employed for detecting line faults.

Because of improved reliability of transformers there is a trend towards the use of single-phase units (one being spare). Incidentally, this has long been British practice. Attention is being paid to increasing mobility to reduce the number of spares. Solid earthing is found on all systems above 70 kV and on 70 per cent of those from 22 to 70 kV.

NEW BOOKS

Manual of Electrical Technology. By C. J. Mitchell, A.M.I.E.E. Pp. 399; figs. 237; index. George G. Harrap & Co., Ltd., 182, High Holborn, London, W.C.1. Price 21s.

This book is written particularly for those whose aim it is to sit for the Associate Membership examination of the Institution of Electrical Engineers, and for that purpose it should be most valuable. There are many books of this type and as they all have to cover more or less the same ground it is sometimes difficult to differentiate between them.

The author commences with the primary cell and the electric current using the old hydraulic analogy of the pump. It it doubtful whether this analogy is wise, but it does prove to be useful when dealing with condensers. One is inclined to feel that this produces a certain neglect of electrostatics, the effects of which are becoming increasingly more prominent.

The book covers a wide range of subject matter and is very readable, but the author is a bit cautious about using his mathematics in the earlier chapters. On page 199 there is an interesting proof, without resort to the calculus that $I = \sqrt{\frac{1}{2}I_{max}}$ in a.c. circuits, but is not the R which occurs in this equation an error? There are several other such points which might be criticized, but they are of minor consequence and the book is, in general, quite suitable for the purpose for which it is intended.—W. C. A.

Worked Examples in Electrical Engineering. By W. T. Pratt, B.Sc. (Eng.), A.M.I.E.E. Pp. 263; figs. 134; index. Hutchinson's Scientific & Technical Publications, Stratford Place, London, W.1. Price 25s.

An important part of the student's preparation for an examination in electrical engineering is the working of numerical questions set in previous examinations. It is not quite satisfactory for him merely to check the accuracy of his result. If it is correct he ought to be able to verify that his method of working is the most expeditious, and if he has failed to answer the question he ought to be able to see why he has failed. The present book will be most useful for this purpose.

It consists of 193 worked examples taken from papers set for the Final Certificate of the City and Guilds in Electrical Engineering Practice, and for part B of the I.E.E. Associate Membership examination. The questions are grouped under 15 chapter headings, prefaced by an explanation of the less familiar technical terms occurring in them The scope of the questions covers most of what is called heavy electrical engineering: generators, motors, convertors and rectifiers, generation, transmission and the economics of generation and transmission, but not measurement or electronics.

The working is full and lucid, but in one or two cases the derivation of formulæ might have been given more concisely. This is a book which can be thoroughly recommended to the advanced student. It is, perhaps, a pity that the index is not more comprehensive and its utility is impaired by the fact that the references are to problem numbers instead of to pages as they should be.—G. W. S.

Erdungen in Wechselströmanlagen über 1 kV. Berechnung and Ausführung. By W. Koch. Pp. 85+vii; figs. 51; index. Springer Verlag, Berlin. Price 10.50 DM.

This monograph discusses the basic principles of earth protection of a.c. plant rated at more than 1 kV. It is based on the rules and regulations of the German I.E.E. (V.D.E.0141) and endeavours to assist the practising engineer not only by explaining the reasons underlying these regulations, but also by evaluating the relevant design formula in a number of graphs. It concludes with two pages of references to the German literature on the subject.—A. B.

Basic Surveys for Planning. Edited for the Association for Planning and Regional Reconstruction by Jaquelin Tyrwhitt, A.I.L.A., A.M.T.P.I., and W. L. Waide, D.T.P. (London), A.M.T.P.I. (Pp. 42 with three fold-in illustrations). Published for the *Architect and Building News* by Gilbert Wood & Co., Ltd., Dorset House, Stamford Street, London, S.E.1. Price 5s.

In this book a small group of specialists attempts to define the basic surveys for planning; the purposes they serve; the information on which surveys should be based; and the special skills required for their compilation.

Books Received

Questions and Answers on Electronics. By E. Molloy. Pp. 128; figs. 65; index. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 5s.

Principles of Electrodeposition. By S. Field, A.R.C.Sc. Pp. 340; figs. 89; index. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 25s.

I.E.E. Elections

NEW PRESIDENT, COUNCIL AND SECTION CHAIRMEN

THE constitution of the Council and the Section Committees of the Institution of Electrical Engineers for 1949-50 has been announced this week. The new President is Prof. E. B. Moullin, M.A., Sc.D., who became the first occupant of the Chair of Electrical Engineering at Cambridge University, established under the auspices of the I.E.E. Dr. Moullin, who is well known for his work in radio communication, is a Dorsetshire man and was born in 1893. He received his education at Cambridge and holds the M.A. degree both of that University and of Oxford. He was a University lecturer at Cambridge from 1920 to 1929, and in the latter year was appointed Donald Pollock Reader in Engineering Science at Oxford, where shortly afterwards he became a Fellow of Magdalen College. He remained at Oxford until his appointment at Cambridge University.

Prof. E. B. Moullin, President

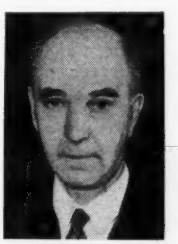
Dr. Moullin's interest in radio communication began about 1909, and later he did much to further the practice of radio-frequency measurements. In 1922 he invented and patented the original thermionic voltmeter which was manufactured by the Cambridge Instrument Co., Ltd., and in 1926 he published his first work on radio-frequency measurements. He also developed a standard ammeter for very high frequencies and designed several other instruments for precision radio measurements.

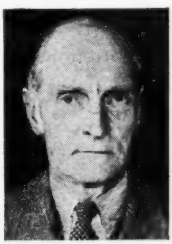
His work at Oxford included the study of background noise in radio receivers and of the mechanism of energy loss in dielectrics. He has devoted much time to the theory of radio aerials and has written papers on the subject. He is the author of "Principles of Electro-magnetism" and "Spontaneous Fluctuations of Voltage." Dr. Moullin was chairman of the Wireless Section of the I.E.E. in 1939-40. He served as a temporary Senior Experimental Officer at Admiralty Signals Establishment, Portsmouth, from 1940-42, as a member of the senior research staff of the Metropolitan-Vickers Electrical Co., Ltd., Manchester, from 1942-44, and was a member of the Radio Research Board of the Ministry of Scientific and Industrial Research from 1934-42. He is a Governor of the College of Aeronautics.

The new vice-presidents are Mr. J. Eccles, B.Sc., chairman of the Merseyside & North Wales Electricity Board, and Sir John Hacking, deputy chairman (operations), British Electricity Authority. Mr. H. Nimmo, chairman of the Southern Electricity Board, has been elected hon. treasurer in succession to Mr. E. Leete.

The vacancies on the Council have been filled as follows: Members: Prof. Willis Jackson, D.Sc., D.Phil., who occupies the University Chair of Electrical Engineering, tenable at the Imperial College of Science, and Sir George H. Nelson, chairman and managing director, English Electric Co., Ltd. Associate members: Mr. J. E. L. Robinson, M.Sc., deputy manager, Power Transformer Department, Ferranti, Ltd.; and Mr. J. A. Saxton, Ph.D., B.Sc., Senior Scientific Officer, National Physical Laboratory. Companion: Sir Cyril Hurcomb, G.C.B., K.B.E., chairman, British Transport Commission.

The following have been elected as officers and as members of the various Sections:—





Mr. J. Eccles and Sir John Hacking, vice-presidents, and Mr. H. Nimmo, hon. treasurer

Measurements.—Chairman, Prof. J. Greig, M.Sc., Ph.D.; vice-chairman, Mr. F. J. Lane, M.Sc.; members of Committee, Mr. J. K. Webb, M.Sc.(Eng.), B.Sc.Tech., and Mr. M. Whitehead.

Radio.—Chairman, Mr. R. T. B. Wynn, C.B.E., M.A.; vice-chairman, Mr. D. C. Espley, D.Eng.; members of Committee, Messrs. A. W. Cole, H. G. Hopkins, Ph.D.,

J. S. McPetrie, Ph.D., D.Sc., R. A. Smith, M.A., Ph.D., and H. Stanesby.

Supply.—Chairman, Mr. J. W. Leach; vice-chairman, Mr. R. Davis, M.Sc.; members of Committee, Messrs. R. H. Abell, E. M. Johnson, M.Sc.Tech., and J. D. Peattie.

Utilization.—Chairman, Mr. C. T. Melling, M.Sc.Tech.; vice-chairman, Mr. A. H. Young; members of Committee, Sir Henry Clay, Bt., M.A., and Messrs. J. G. Craven, J. M. Goodall, and J. W. T. Walsh, M.A., D.Sc.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AS from 1st July, **Mr. H. E. Brooks** has been appointed works manager of the Hereford and Birmingham factories of Harcourts Ltd., which undertaking has now been incorporated in the Edison Swan Electric Co., Ltd. **Mr. N. Dennes** has retired from the position of general manager of Harcourts but maintains his connection in a consultative capacity at the Hereford factory.

Mr. Oswald F. Mingay, managing editor and publisher of *Radio Electrical Weekly* (Sydney) and owner of the Mingay Publishing Co., is expected to arrive from Australia (with Mrs. Mingay) to-morrow Saturday. Mr. Mingay has been a leading figure in the electrical and radio field for many years—a vigorous publicist for electrical development, and is a member of the British, Australian and American Institutions of Radio Engineers, and of the Institute of Electronics. He served with A.I.F. Signals in France in the 1914-18 war and thereafter remained on the active reserve list until he enlisted for full time service in the second world war with the rank of captain with Divisional Signals, Eastern Command. In 1943 he was seconded to the Ministry of Munitions Directorate of Radio and Signal Supplies and was sent to the United States on organization of radar and telecommunication equipment procurement for the Australian and Allied services in the Pacific zone.

Mr. O. F. Mingay

Mr. N. Rhodes has been appointed street lighting superintendent to Bradford Corporation. He has been with the Corporation for over twenty years and has been acting as superintendent since July, 1948. This is a new post at Bradford

Mr. S. D. Lay, F.R.S.A., F.I.E.S., is taking up an engineering appointment with the Australian Department of Labour and National Service in Melbourne, and sailed on 14th July. For the past three years he has been at Courtauld's, Ltd., headquarters in Coventry as their lighting engineer. Before 1946 he was with the British Thomson-Houston Co., Ltd., acting as lighting engineer in the North-Eastern area.

Mr. J. McInnes Slater, C.A., has been appointed secretary of Drysdale & Co., Ltd. Mr. Slater was educated at the John Neilson Institute, served his apprenticeship with Wilson Stirling & Co. of Glasgow, and qualified as a chartered accountant in 1936. He joined Drysdale & Co. in 1946 as chief accountant, and was subsequently appointed deputy secretary. He succeeds the late Mr. A. Climie as secretary of the company.

Mr. L. Harvey, M.I.E.E., construction engineer, Merseyside and North Wales Sub-Area No. 4 headquarters, has been appointed sub-area engineer of the South-West Scotland Electricity Board. Mr. Harvey was for several years in the service of the North Wales Power Co., Ltd., Electricity Distribution of North Wales, Ltd., and the Yorkshire Electric Power Co., Ltd.

In our last issue we reported that the Electrical Association for Women had awarded The Caroline Haslett Travelling Exhibition for 1949 to **Miss Elizabeth Gwillim** of Dumfries. This scholarship, the first to be awarded in Scotland, will enable Miss Gwillim to make a two months' tour of the Netherlands during the autumn. Miss Gwillim, who is now the senior housecraft adviser with the Dumfries and Galloway Sub-Area of the South West Scotland Electricity Board, was educated at Dumfries Academy and at the Glasgow and West of Scotland College of Domestic Science. She joined the former Dumfries County electricity undertaking in 1937 as chief demonstrator. Miss Gwillim is prominent

Miss Elizabeth Gwillim

in E.A.W. circles and is the holder of an E.A.W. diploma for housecraft advisers. In 1948 she represented Scotland in the women's final of the public speaking competition organised by the Electrical Development Association in London.

Ekco-Ensign Electric, Ltd., announces the appointment of **Mr. F. Priestly** as manager of their depot at 40 & 42, Summer Row, Birmingham, 3.

Mr. J. Barlow has been appointed works manager of the new factory of African Lamps (Pty.), Ltd., Johannesburg, South Africa, in which Ekco - Ensign Electric, Ltd., recently acquired a large manufacturing interest. Mr. Barlow is relinquishing his present position as process engineer in the lighting factories at the Ekco Works and will take up his new duties in September next.

Mr. J. Barlow

Mr. F. la T. Budgett, B.Sc. (Eng.), A.M.I.E.E., has been appointed senior engineering assistant to the technical engineer, Chief Engineer's Department, Eastern Electricity Board. Previously he was technical assistant at Fulham generating station, B.E.A. London Division.

Mr. A. G. Bradbury, who has spent some years with the Chloride Electrical Storage Co., Ltd., in various capacities at home and abroad, has joined the Edison Swan Electric Co., Ltd., and has been appointed sales manager, Accumulator Department, with effect from 8th June last.

Mr. H. T. Ransley, A.M.I.E.E., has now joined the staff of the chief engineer of the Eastern Electricity Board as senior engineering assistant to the development engineer. Mr. Ransley was formerly operation and maintenance engineer on the headquarters staff of the S.E. Scotland Electricity Board.

Viscount Falmouth, M.I.Mech.E., Companion I.E.E., has been re-elected president of the British Internal Combustion Engine Research Association for 1949-50, and **Mr. J. Jones,** M.I.Mech.E., chief engineer of the National Gas and Oil Engine Co., Ltd., has been elected chairman of Council in succession to the late Mr. E. P. Paxman.

Mr. R. H. Dowsett has been appointed Midland area manager for Simpson, Baker & Co., Ltd., as from 1st July. For thirteen years he was Midlands branch manager for A. C. Cossor, Ltd., and for nine years was associated with Smart & Brown (Engineers), Ltd.

Mr. S. Baxter who, as we reported in our issue of 24th June, has resigned from the position of works manager of the Rainville Engineering Co., Ltd. (formerly Samuel Baxter), intends to devote his time to consulting work at 57, North Worple Way, London, S.W.14 (telephone: Prospect 5230). For many years he has specialized in the design of fractional h.p. motors.

Mr. W. H. Henman is president of the British Non-Ferrous Metals Federation and chairman of the Executive Committee for 1949-50. The vice-presidents are **Messrs. W. J. Terry** and **H. E. Jackson,** and the treasurer **Mr. A. L. Johnson,** M.A.

Princess Elizabeth, President of the Royal Society of Arts, visited the Society's House on Monday last when she presented the Albert Medal to Sir Giles Gilbert Scott, and accepted on behalf of the Society a portrait of Dame Caroline Haslett. This portrait was presented to the Society in May, 1948, by leading members of the

Students at the B.E.A. Summer School, Magdalen College, Oxford, last week. Lord Citrine, chairman of the B.E.A., is in the centre; on his right is Mr. J. W. Thomas (director of training, safety and welfare) and on his left Mr. R. G. Bellamy (education and training officer)

British Electrical and Allied Manufacturers' Association. It was painted by Sir Gerald Kelly, R.A., and exhibited at the Royal Academy of Arts last summer. The presentation at the ceremony was made by Mr. G. Leslie Wates, chairman and managing director of Johnson & Phillips, Ltd., who was supported by Mr. P. V. Hunter, chairman of the Cable Makers' Association, Mr. W. H. Williams, chairman of the Electric Lamp Manufacturers' Association, and Colonel B. H. Leeson, Director of the B.E.A.M.A. Dame Caroline. who has been a member of the Council of the Society since 1941, is the first woman to have been so elected.

Mr. R. T. Conlon has taken up the position of technical sales representative with the Bowthorpe Electric Co., Ltd., and will also act in this capacity for the associated company, Hellermann Electric, Ltd.

Mr. R. W. L. Harris, B.Sc., has been called to the Bar of the Middle Temple, thus enlarging the small band of engineers who are barristers-at-law. Mr. Harris is the registrar and secretary of the Professional Engineers' Appointments Bureau and is a corporate member of the three senior engineering Institutions.

To celebrate the jubilee of **C. A. Newton & Co., Ltd.,** electrical engineers, Derby, the staff and their families were recently entertained at a garden party at Wheathills House, Kirk Langley, the home of the founder, Mr. C. A. Newton, A.M.I.E.E., and of Mrs. Newton, 150 guests attending. During the day Mr. Newton presented long-service awards to a number of the staff.

A celebration was held at the Hoover factory at Perivale, Middlesex, on 1st July to mark the thirtieth anniversary of the company's chairman and managing director **Mr. C. Colston,** C.B.E., M.C., D.C.M.

The luncheon was attended by all members of the Quarter of a Century Club, all of whom have been with Hoover, Ltd, for twenty-five years or more. Mr. W. M. Tribute, advertising and publicity manager, the member with the longest service, presented Mr. Colston with his 30 years' service badge.

On 2nd July, in perfect summer weather, the **General Electric Co., Ltd.,** held its annual championship sports and gymkhana at the Magnet Sports Ground of the Witton Works, over 5,000 spectators attending. Sir Harry Railing, the chairman of the company, and Lady Railing were among those present and they were welcomed by Mr. J. J. Gracie, general manager of the Witton Engineering Works. Innovations included a baby show for the best boy and girl under twelve months old, and other attractions were side shows and a Punch-and-Judy show for the children. After holding the M.J. & A. H. Railing Cup for the departmental tug-o'-war since 1938 the foundry were beaten in the semi-final by the switchworks, who repeated their success in the final by defeating the drawing offces. The cups and prizes were distributed by Lady Railing, and a successful day concluded with a dance in the Magnet Club.

Despite the slight break in the sunny weather the annual **E. K. Cole** sports meeting at the Ekco Ground on 9th July was attended by over 2,000 spectators, who saw a varied mixture of club and open events. In the children's corner a committee had organized 65 events. At the end of the meeting Mr. D. Radford, chairman of the Ekco A. & C.C, introduced Mr. N. C. Robertson, deputy managing director, whose wife distributed the prizes. The club championship trophy was won by Ekco-Ensign Electric, Ltd.

Rist's Wires & Cables, Ltd., of Newcastle-under-Lyme, held their annual sports and fete at the works sports ground on 2nd July. Present at the opening were the Mayor and Mayoress of Newcastle, Mr. and Mrs. D. A. V. Rist, Mr. and Mrs. L. S. G. Rist, members of the executive staff, and friends of the management. Mrs. D. A. V. Rist performed the opening ceremony which was followed by the crowning of the Works Queen, Miss Irene Adcock.

A charity cricket match was played between the Brush Cricket Club and Mr. S. A. Lane's County XI on 3rd July, at Loughborough. The proceeds of the match, which was attended by over 2,500 people, are to be given to the National Playing Fields Association. The match was organized by Mr. S. A. Lane, a director of the **Brush Electrical Engineering Co., Ltd.,** Messrs. A. E. G. Baring and C. Dennis and the Brush Sports and Social Club. Mr. Lane's XI won by 79 runs.

Obituary

Mr. R. C. W. Joyce.—The death occurred, following pneumonia, on 29th June, of Mr. R. C. W. Joyce, A.M.I.E.E., commercial officer for the South Eastern Board's Mid-Sussex Sub-Area. Mr. Joyce, who was forty-three, received his training at the Borough Polytechnic and Queen Mary College (University of London). After a short period fith the E.L.M.A. Lighting Service Bureau, he went to the Westminster Electric Supply Corporation. In 1935 he joined the Yorkshire Electric Power Co. at Doncaster, and at vesting day was district manager (power sales) for the south western district. He joined the South Eastern Board in June, 1948. Mr. Joyce played a

prominent part in the activities of the Institution of Electrical Engineers in Yorkshire and for some time was assistant secretary for the North Midland Centre. The funeral, which took place at Brighton on 4th July, was attended by senior officers of the Board.

Mr. A. H. Seabrook.—The death occurred on 2nd July, at Southwold, of Mr. Arthur Hugh Seabrook, M.I.E.E., M.I.Mech.E., who was at one time prominent in the electricity supply industry. Mr. Seabrook was educated at the King Edward VI School, Chelmsford, and received his engineering training at Crompton & Co.'s works in that town. After service as assistant electrical engineer at Great Yarmouth and Hampstead he became "chief" at Barking. From there he went to West Ham as engineer and manager and was then, from 1909 to 1918, borough electrical engineer of St. Marylebone. He was a pioneer in lowering the price of electricity to encourage domestic consumption, and was one of the "Point Fives," i.e., those who instituted a ½d per kWh secondary charge in their two-part tariffs. Mr. Seabrook was also an enthusiastic electrical publicist and set up showrooms in which demonstrations were frequently given.

Upon leaving St. Marylebone he acted as consultant to a number of electricity supply undertakings and he was for a period "executive officer" of the Electrical Industries' Benevolent Association. Later he became a director of Electro-Mersible Motors & Pumps, Ltd.

Wills

Sir John Malcolm Fraser, Bart., G.B.E., R.N.V.R., formerly chairman of Callender's Cable & Construction Co., Ltd., Callenders Trust, Ltd., Rotunda, Ltd., and Anchor Cable Co., Ltd., and director of Electrical Facilities, Ltd., who died in his yacht at Poole Harbour on 4th May last, left £559,835 gross (£541,900 net).

Mr. D. W. Cherry, Executive Engineer, G.P.O., who died on 28th March, left £6,080 gross (£4,439 net).

B.S.I. Specifications

AIRBREAK thermostats for domestic a.c. water heating systems, immersion and storage types, is the subject of B.S. 1555, the object being to specify a range which shall be as interchangeable as possible; an appendix deals with the determination of operating temperature and differential setting.

Interchangeability is likewise the aim of BS. 1556, which prescribes 3 kW immersion heaters suited to the range of galvanized tanks and cisterns specified in BS. 417 and copper cylinders in BS. 699.

The revised version of BS. 23 for overhead trolley and contact wires specifies one section only of conductor for trolley-bus and tramway lines, but two sections of wire are permitted for electric railways.

To the series of specifications relating to chemicals for electroplating there has been added BS. 1561, which details the composition of silver anodes and salts.

Dimensions and resistance of conductors for, as well as the construction and testing of, cables insulated with polythene for up to 250 V and sheathed with polyvinyl chloride (PVC) or lead alloy are dealt with in BS. 1557.

The revised version of BS. 1137 for insulating sheets made of paper bonded with synthetic resin, for use at power frequencies, is now divided into mandatory and optional classes with the object of reducing testing to the minimum.

Copies are obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1, for 2s, except the two last mentioned which are priced at 2s 6d each.

Tinplate Workers' Scholarships

MR. A. L. Johnson, Master of the Worshipful Company of Tinplate Workers *alias* Wire Workers, has sent us a list of awards of travelling scholarships and prizes made for 1949. The students' names are given below; the association presenting the scholarship is shown in parentheses:—

Travelling Scholarships—J. F. Light, Standard Telephones & Cables (Cable Makers' Association); J. W. Hunter, I.C.I. Metals Division (Extruded Brass & Copper Association); J. Birrell, Burntisland Shipbuilding Co. (Electrical Trades Union); W. G. Marshall, Kayser Ellison & Co. (British Steel Wire Industries Association); G. M. Harries, Steel Co. of Wales (Welsh Plate & Sheet Manufacturers' Association); R. E. Durling, Henley's Telegraph Works (Covered Conductors Association); K. P. Baldy, International Combustion (Water-Tube Boiler Makers' Association); J. W. Jacobs, Edison Swan Elec. Co. (Cable Makers' Association); H. Dixon, B.I. Callender's (Cable Makers' Association); D. T. Ormrod, Metropolitan-Vickers (B.E.A.M.A.); B. J. Jordan, Metropolitan-Vickers (B.E.A.M.A.); G. A. Holmes, Enfield Cables (Cable Makers' Association).

Prizes value £10 each.—R. Buxton, Kayser Ellison & Co. (British Steel Wire Ind. Association); K. A. Potter, East Mid. Electricity Board (Electrical Trades Union); L. W. Warren, International Combustion (Water-Tube Boiler Makers' Association).

London's Future Transport

WORKING PARTY'S COMPREHENSIVE PLANS

BRIEF reference was made in our last issue to the report presented to the Minister of Transport by the "Working Party" of the Railway and London Transport Executives set up by the British Transport Commission. In this, proposals are made for the development during the next twenty or thirty years of underground and surface rail transport in London and an extensive surrounding area. The plans take into consideration the recommendations of the Railway (London Plan) Committee, under the chairmanship of Professor Sir Charles Inglis, in 1946 and 1948.

The proposals are divided into "first priority" and "lower priority" classes. In the first the principal recommendation is that four new tubes with a total length of 49¼ miles, costing £114 million, should be constructed. With this work the electrification of steam surface lines would be undertaken. There are also three major schemes for the electrification of steam lines and suggestions for the improvement of Southern Region services.

Two Types of Tube

New tubes of two types are proposed. Some are to be for main-line size rolling stock, with few stops in the central area, big seating capacity, and services up to 25 trains an hour intended to serve the outer suburban areas, and others with London Transport type tube rolling stock, frequent stops in the central area, ample standing capacity, and services up to 40 trains per hour which will serve inner suburban areas. The tunnels for main-line size tubes will be 17ft in diameter and for London Transport tube size 12ft.

The proposed Route "A" is a 17ft tube, of which the tunnel sections would commence from two northern points, West Hampstead and Finsbury Park, joining up near Euston. From here the new tube would have stations at Russell Square, Chancery Lane, Ludgate Circus, continuing beneath the Thames to Elephant and Castle, and joining the Southern Region lines near Loughborough Junction. From West Hampstead northwards the tube trains would run over the present London Midland Region suburban line, which would be electrified to Elstree, Radlett, and St. Albans (at present served from St. Pancras). From Finsbury Park northwards the tube trains would run over the Eastern Region (present King's Cross) line which would be electrified to Hitchin over two routes: (a) via New Barnet, Potters Bar and Hatfield, and (b) via Enfield Chase and Hertford. Beyond Loughborough Junction in the south the trains would incorporate the service now terminating at Holborn.

Route "B" is a new tunnel route for freight traffic only, beneath the Thames, between Canning Town in the north and Blackheath in the south, linking the main lines north of the river with the Southern Region lines at Hither Green.

Route "C" is a new inner suburban 12ft tube from the Tottenham-Edmonton area with stations at Manor House, Finsbury Park, King's Cross, Euston, Oxford Circus, Green Park, Victoria, Vauxhall, Stockwell, Brixton, Streatham Hill, Streatham, Norbury, and on to East Croydon. The northern and southern terminals are still being examined and must be dependent, to a large extent, on the sites that can be found for rolling stock depots. This tube will be linked with the Bakerloo line at Oxford Circus.

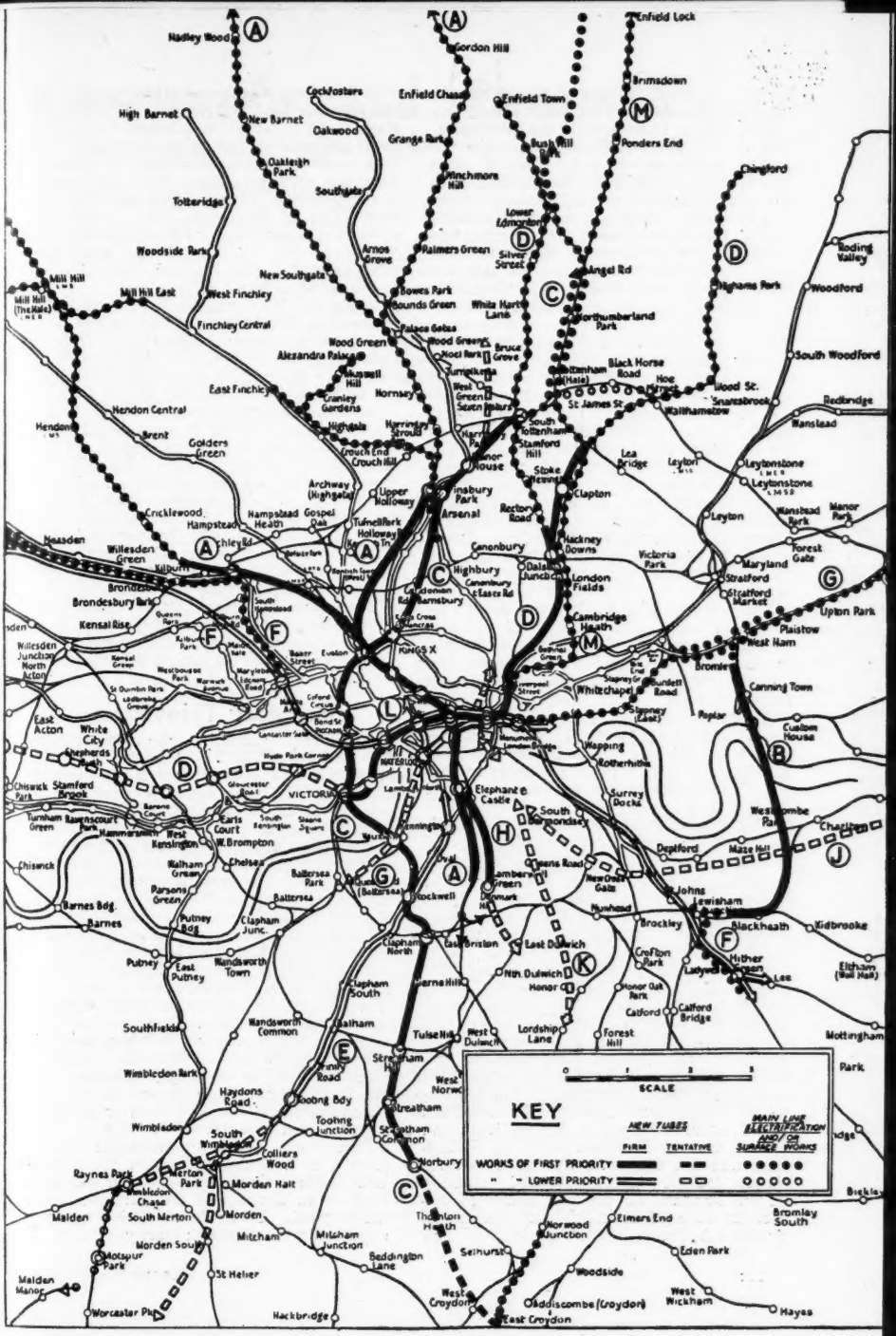
Route "D" is a new 12ft tube, of which the tunnel section will commence at Hackney Downs, with stations at Liverpool Street, Bank, Ludgate Circus, Aldwych, Trafalgar Square and Victoria. North of Hackney Downs the tube trains will proceed by two routes which will be electrified, (a) via the existing (Liverpool Street) Eastern Region line from Hackney Downs to Seven Sisters, Bruce Grove (Tottenham), Edmonton and Enfield Town, and (b) via the existing (Liverpool Street) line to Clapton, Hoe Street, Wood Street (Walthamstow) and Chingford. The possible westward extension of this line falls into a lower priority.

Previously Planned Extensions

Plans are already in hand for the commencement in 1950 of the extension of the Bakerloo line from Elephant and Castle to Camberwell, to give facilities in south-east London and to enable services on the whole of this heavily taxed line, in both north and south London, to be increased.

Completion of the following works under the 1935/40 programme of London railway works which could not be finished owing to the war, is recommended: (1) Extension of the Northern Line tube from Highgate to Alexandra Palace, from Mill Hill East to Edgware, and from Edgware to Bushey

(Facing page): Map showing the proposed transport developments in London


Hadley Wood
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Enfield Town
Brimsdown
High Barnet
New Barnet
Oakwood
Grange Park
Bush Hill Park
Ponders End
Oakleigh Park
Southgate
Winchmore Hill
Chingford
Tolteridge
Lower Edmonton
Woodside Park
Arnos Grove
Palmers Green
Silver Street
Roding Valley
New Southgate
Angel Rd
Highams Park
Woodford
Mill Hill
Mill Hill East
West Finchley
Bowes Park
Sounds Green
White Hart Lane
Finchley Central
Palace Gates
Northumberland Park
Wood Green
Bruce Grove
South Woodford
Alexandra Palace
Noel Park
Tottenham (Hale)
Black Horse Road
Hoe Street
Wood St.
Snaresbrook
East Finchley
Russell Hill
Crawley Gardens
Hornsey
St James St
Walthamstow
Redbridge
Hendon Central
Highgate
Harringay
South Tottenham
Wanstead
Hendon
Brent
Golders Green
Crouch End
Crouch Hill
Manor House
Stamford Hill
Stoke Newington
Lea Bridge
Leyton
Leytonstone
Archway (Highgate)
Upper Holloway
Finsbury Park
Clapton
Cricklewood
Hampstead
Hampstead Heath
Gospel Oak
Tufnell Park
Arsenal
Rectory Road
Leyton
Wanstead Park
Manor Park
Neasden
Willesden Green
Kilburn
Chalk Farm
Canonbury
Hackney Downs
Victoria Park
Forest Gate
Maryland
Stratford
Stratford Market
Brondesbury
Brondesbury Park
Highbury
Dalston Junction
London Fields
Upton Park
Kensal Rise
Queens Park
South Hampstead
Camden Road
Barnsbury
Cambridge Heath
Plaistow
West Ham
Willesden Junction
North Acton
Kensal Green
Westbourne Park
Warwick Avenue
Baker Street
Euston
Kings X
Bromley
Whitechapel
Canning Town
Aldgate East
Shoreditch
Liverpool Street
Bethnal Green
Stepney (East)
Poplar
East Acton
White City
Shepherds Bush
Oxford Circus
Bond St
Lancaster Gate
Marble Arch
Hyde Park Corner
Mansion House
Monument
London Bridge
Rotherhithe
Custom House
Chiswick Park
Stamford Brook
Gloucester Road
VICTORIA
Elephant & Castle
Surrey Docks
South Bermondsey
West Kensington
Earls Court
South Kensington
Sloane Square
St James's Park
Westminster
Lambeth North
Waterloo
Turnham Green
Ravenscourt Park
Hammersmith
West Brompton
Chelsea
Battersea Park
Queens Road
New Cross Gate
Deptford
Maze Hill
Chiswick
Walham Green
Sloane Square
Pimlico
Vauxhall
Oval
Kennington
Parsons Green
Battersea
Rockwell
Lewisham
Barnes Bdg.
Barnes
Putney Bdg.
Clapham Junc.
Brockley
Blackheath
Kidbrooke
Putney
East Putney
Wandsworth Town
Clapham North
Stockwell
Brixton
Herne Hill
East Dulwich
Crofton Park
Hither Green
Eltham (Well Hall)
Clapham South
Nunhead
Honor Oak
Lee
Southfields
Wandsworth Common
Balham
Tulse Hill
West Dulwich
Honor Oak Park
Catford
Catford Bridge
Lordship Lane
Forest Hill
Nottingham
Wimbledon Park
Streatham Hill
Streatham
Haydons Road
Tooting Bdy
Wimbledon
South Wimbledon
Tooting Junction
Streatham Common
Colliers Wood
Norbury
Raynes Park
Merton Park
Morden Hall
Wimbledon Chase
Malden
South Merton
Morden
Thornton Heath
Norwood Junction
Elmers End
Bromley South
Mitcham
Mitcham Junction
Selhurst
Eden Park
Motspur Park
Morden South
Beddington Lane
Malden Manor
St Helier
Woodside
Worcester Pk
Hackbridge
West Croydon
Addiscombe (Croydon)
West Wickham
East Croydon
Hayes
SCALE
KEY
NEW TUBES
FIRM
TENTATIVE
MAIN LINE ELECTRIFICATION AND/OR SURFACE WORKS
WORKS OF FIRST PRIORITY
" - LOWER PRIORITY

Heath; (2) Four-tracking of the Metropolitan Line from Harrow to Rickmansworth.

The report recommends the electrification of (1) The suburban service on the Tring, Berkhamsted and Watford lines (the present L.M.R. line into Euston). This line will be diverted through a new connection at Kenton so as to run over electrified tracks into Marylebone. (2) The present Aylesbury line services via Rickmansworth and Harrow-on-the-Hill into Marylebone; and (3) The Eastern Region High Wycombe-Beaconsfield-Denham services into Marylebone.

The electrification and widening of the London, Tilbury and Southend line from Shoeburyness into Fenchurch Street, with main-line size rolling stock, and the doubling of the Ockendon Branch is recommended. A possible western extension of the London, Tilbury and Southend line through the city in tube of main-line size falls into lower priority.

Finally, the report recommends the electrification of the Cambridge line from Liverpool Street, via Waltham Cross, Broxbourne to Bishop's Stortford, including the Churchbury loop, with main-line size rolling stock.

On the Southern Region the report recommends the introduction of double-decker trains or the lengthening of trains, at an early date, from 8 to 10 cars, precedence being given to the south-eastern suburban lines.

Also recommended, as first priority, are two widenings of the Southern Region lines from Norwood Junction to Purley and from Bickley to Swanley Junction, so as to provide additional tracks for an intensified service from Crawley/Three Bridges New Town and the St. Paul's Cray L.C.C. Estate, and the electrification of the Oxted Branch.

The works of "lower priority" proposed include four further new tubes and, in addition, extensions of earlier works. They comprise: (1) Possible western extension of the "first priority" tube (Route "D") beyond Victoria. (2) A new small-size tube paralleling the Northern Line between Kennington and South Wimbledon, with branches to Chessington South and North Cheam (Route "E"). (3) A new tube of main-line size linking Neasden with the Tring, Aylesbury and High Wycombe lines from Marylebone and running via Marylebone, Marble Arch, Trafalgar Square, Bank and Fenchurch Street, to Hither Green and thence via the Dartford Loop to Gillingham and via the main line to Sevenoaks (Route "F"). (4) A westward extension of the London, Tilbury and Southend service in tube of main-line size via Bank, Southwark Street and Waterloo, to link with Southern Region suburban services on the western section (Route "G"—second stage). (5) Alternative schemes for a new small-size tube extending the Northern City Line southwards from Moorgate, the present Southern terminus, under the river either in the direction of Crystal Palace or through New Cross to Woolwich, with probably a cross-over connection to Dagenham (Routes "J" and "K"). (6) a new small-size tube extending the Holborn-Aldwych line to Waterloo (Route "L").

While the Working Party presumed the removal of Blackfriars railway bridge and the surface railway viaducts to Holborn (including the bridge over Ludgate Hill) and south of the river as an important contribution to the replanning of the City of London and the development of the South Bank, they felt bound to recommend that, from the point of view of transport, the removal of Charing Cross and Cannon Street railway bridges (as recommended in the County of London Plan) would not be justified. If it should be decided that the two bridges should be removed, the Working Party considers that four additional tubes will be required over and above the other tubes already recommended.

The Working Party states that there should be no insuperable difficulties from the civil engineering aspect in carrying out the large and complex programme proposed.

Hospital Television

PORTABLE television, the same type as used by the B.B.C. for outside broadcasts, is enabling the 400 delegates to the International Gynæcological Congress, now being held in London, to watch surgical operations being performed at the University College Hospital without having to crowd into the small gallery of the operating theatre. It is the first time in this country that an international gathering has seen this application of television, to which the greatest importance is attached in medical circles as a method of training students.

Two 625-line Marconi Image Orthicon television cameras are mounted in the gallery of the operating theatre, a position which enables them to obtain the best possible views of the operations being performed. The associated equipment is in the anteroom outside the operating theatre, while the actual pictures are shown on the 20in screens of two "Cintel" monitor receivers installed in a separate lecture hall.

Last week we were privileged to be present at a demonstration of this equipment when a Caesarian operation was televised to an audience of medical students in the hospital. Every detail of the surgeon's work could be seen with clarity.

COMMERCE and INDUSTRY

Dynamo and Motor Prices : Trade with North America

THE members of the Associated Dynamo and Motor Monufacturers, in pursuance of their policy, announced over a year ago, of supporting the Government in its desire to stabilize prices, have decided not to increase prices of a.c. and d.c. motors be[illegible] their present level. This decision has been made despite the fact that costs of labour and materials have risen approximately by the following percentages since the date of the last general increase of prices at the beginning of 1947: Ferrous metals, 19; electrical sheet steel, 14; copper, 0.5; aluminium, 24; tin, 49; lead, 17; insulating materials, 17; labour, 6. In addition, the costs of common services have also increased over this period. The motor manufacturers are able to continue their policy of maintaining prices at current levels, principally because of increased output, coupled with improved methods of production and increased availability of raw materials. This decision has been made in the national interest and particularly to assist other manufacturing industries in the national export drive, but it will be appreciated by purchasers that a continuance of this policy of maintaining prices at current levels will depend upon whether or not wages and costs of materials in the future are maintained around current levels also.

Agricultural Shows

The Southern Electricity Board set a high standard of display at the Royal Counties Agricultural Society's Show held at Reading recently. A large number of applications of electricity on the farm and in the home were demonstrated. The Horticultural Section was a particularly good display and in line with this the Board included a comprehensive outdoor section devoted to the uses of electricity in the garden and nursery. Mr. H. Nimmo, chairman of the Board and chairman of the E.D.A. Rural Electrification Advisory Committee, together with Mrs. Nimmo, Mr. R. R. B. Brown, deputy chairman of the Board, Sir Hubert Young, chairman of the Consultative Council, and other officials visited the Show. Mr. L. Gamage, vice-chairman, G.E.C., and the Hon. Mrs. Gamage also attended.

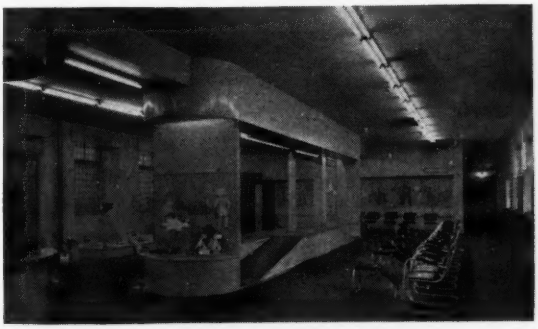
At this year's Royal Cornwall Show held on 13th and 14th July at Falmouth, the South Western Electricity Board exhibited a wide range of electrical equipment for farm, domestic and commercial use, much of which will be seen under working conditions. The exhibits, which were displayed in a single large marquee, covered horticultural and farming machinery, dairy equipment, pumps and motors, poultry equipment, domestic cookers and appliances, commercial cookers and appliances and refrigeration.

Farm Installations

Farm and horticultural electrical installations are the subject of Code of Practice 325, which has been issued in draft form for comment by 10th August. The document is of wide scope and thorough-going in its treatment of the subject. Copies of the draft, proof reference CP(B)869, are obtainable for 9s from the British Standards Institution, 24, Gillingham Street, London, S.W.1.

Glasgow Store Lighting

A good example of the way fluorescent lighting can be used with effect in any situation and harmonized with any architectural design is provided by a recent installation in the Children's Shoe Department of McDonalds, Ltd., Glasgow. As can be seen from the illustration, the clean lines and modernistic design of the room and its furniture, including the central promenade, the display panels and tubular chairs, are admirably set off by the two continuous double rows of fluorescent lamps



"Osram" fluorescent lighting in a Glasgow store

which flank the central feature. This effect has been achieved with twenty-four 4ft 2-lamp fittings, twelve in each row, butted together to give a continuous light source; the lamps used are of the "warm white" variety. In addition the windows and decorative panels are illuminated by "warm white" fluorescent lamps concealed behind pelmets. In this installation "Osram" lamps in G.E.C. fittings have been used throughout.

Greyhound Track Installation

The electrical installation of the Hall Green Stadium (Birmingham) owned by the Greyhound Racing Association, Ltd., has recently been renewed and brought up to date. The installation was planned and carried out by Parker Winder & Achurch, Ltd., using switch and distribution gear

Part of main switchboard panels at Hall Green Stadium

supplied by Sanders, Wednesbury. The original installation was thirty years old, and several minor and one serious breakdown, made a major overhaul imperative. The scheme was divided into Section "A", immediate needs, and Section "B", necessary but not directly affecting the running of the track.

Section "A" entailed removal of an old oil breaker, and installation of new panels in the substation. From this substation approximately five miles of armoured cables were laid underground to essential distribution points via the switch room and generator room, main cables being 0.3in p.i.l.c.s.t. or s.w.a., sub main cables 0.15in and general distribution cables 0.0225in.

A complete new switch and generator room was built to house the standby generator and the Sanders main control panels. These panels feed main track lighting, stands, exterior and car park lighting, photo-finish equipment, hare control, kennels, etc. Diesel equipment has been installed by G.R.A. engineers, and coupled into the main controls to enable the track to operate under fuel economy conditions. In view of the fact that the main supply is duplicated through change-over switches, the possibility of a breakdown is now virtually non-existent.

Exports to North America

Speaking at the annual luncheon on 7th July of the British Export Trade Research Organization ("Betro"), Mr. A. G. Bottomley, Secretary for Overseas Trade, emphasized that market research of the kind carried out by Betro was essential. He referred particularly to trade with North American markets, which were very complex and of varying characteristics. In meeting the requirements of customers in those markets the tiniest matters could often tip the scale in our favour. Although the Board of Trade was rendering all the assistance possible, industry and commerce must themselves take the initiative in using the technique of market research, especially in the prosecution of the "dollar drive."

Mr. Neville Bland, United Kingdom Trade Adviser in the United States, also stressed the need for market research. He said that there were wonderful prospects for those who would study the methods of Americans in their own market and set about the business in the same determined and organized way. He advocated group organization rather than dissipated effort by individual firms. The Government had set up the Dollar Exports Board (3082, Thames House North, Millbank, London, S.W.1) to give assistance to would-be exporters to North America, and information about the United Kingdom trade organization in the United States could be obtained from the Board of Trade's Commercial Relations and Exports Department, North American Division, I.C. House, Millbank, S.W.1.

Non-Ferrous Metals Federation

Dr. Horace W. Clarke, the retiring president of the British Non-Ferrous Metals Federation, presenting his report at the annual meeting on 7th July, referred to the "major problem" of metal prices. He said that to-day they had no freedom to buy their raw materials where they wished. They were compelled to purchase from the Ministry of Supply at prices which the Ministry fixed—at the time of speaking some £30 above the world price. This was a situation which was causing them the grav-

est anxiety. The Federation, from the outset, had taken the initiative in pressing the Government to reduce its price to the world level and since the end of April, when the American price began to fall rapidly, there had been two substantial reductions in the Ministry's price for copper and other virgin metals. They were supported in their campaign by such important users of non-ferrous metals as the Cable Makers' Association and the Association of Radio Battery Manufacturers.

The Federation considered that the time had arrived for the ending of bulk purchasing and the re-opening of the London Metal Exchange.

Hopkinsons Training Scheme

To ensure a flow of suitably trained men for appointments as junior executives and to fill vacancies on their sales and technical staffs, the Hopkinson Electric Co., Ltd., instituted a special training scheme when they moved to their new factory at Cardiff. Known as student engineers, the entrants were selected either through the Government Business Training Scheme for ex-Servicemen or from the factory. All the trainees spend the first year of the course in the factory. At the end of this period the trainees are routed according to the type of appointment for which they are best suited. The first three students to finish the course have recently been appointed, one as assistant chief of the Sales Order Department, one as estimator and one to the Engineering Development Section of the Design Department.

E.W.F. Directory

The Electrical Wholesalers' Federation has issued a new list of members. This includes an alphabetical list and one showing the membership under towns.

B.E.A. North-Western Division

Pending the construction of additional offices at British Electricity House, Didsbury, the Secretary's Department (including establishments, purchasing, wayleaves, public relations, welfare, education and training and nursing sections) and the Generation Operation Department of the North Western Division of the British Electricity Authority have removed to "Woodlands," Woodlands Drive, Offerton, nr. Stockport. The postal address for the two Departments remains as before, but the telephone number is Great Moor 4421.

Fluorescent Lighting Display

A special display of fluorescent lighting has been arranged at the Regent Street Service Centre of the London Electricity Board during the "Colonial Month" Exhibition. A feature is a Union Jack comprising twenty-six standard 5ft 80 W "Atlas" coloured fluorescent lamps, which demonstrates the colourful effects and possibilities of fluorescent illumination. The demonstration, which has been organized by Mr. Besemer of the London Electricity Board, uses equipment supplied by Thorn Electrical Industries, Ltd. Our picture shows Mr. Ogunnaike, Sheik Abdul Rehman and Miss Florence Wamala, with Col. W. V. Crook of the Colonial Office, during their visit to the Service Centre.

Colonial visitors at the Regent Street Service Centre of the London Electricity Board

Industrial Supervision

To guide its education activities the Institute of Industrial Supervisors has set up an Educational Advisory Panel. Among other things it will consider the award of an Institute Certificate for the successful completion of an approved course, as well as prizes for papers.

The results of an examination of current practice undertaken by Mr. F. J. Burns Morton (general works manager, South Wales, Enfield Cables, Ltd.) are surveyed in a booklet just published entitled "The Supervisor and the Specialists." This is intended to give a general survey of the problem, and the common ground between the supervisor and each of the specialists will be examined in detail in a series of

pamphlets to be published by the Institute. These publications will be available to non-members at 2s 6d (including postage) from the Institute at 47, Temple Row, Birmingham, 2.

Metal Price Reductions

A third reduction in two months of the prices of copper, lead and zinc brings the prices to the level of those current in the United States, taking into consideration freight, delivery charges, etc. The Ministry of Supply announces that as from 12th July the new prices per ton will be as follows:—Electrolytic copper, £104 (£13 10s decrease); good soft pig lead, £75 10s (£6 10s decrease); g.o.b. zinc £58 (£20 decrease).

Trade Announcements

Ekco-Ensign Electric, Ltd., has opened a new depot and showrooms at 57, Hounds Gate, Nottingham. (Telephone: Nottingham 45862; telegrams: Ekcolight, Nottingham). Mr. G. P. Bush, who has been representing the company in this area, has been appointed depot manager. He will be assisted by Mr. C. G. Stanwick as chief storekeeper. The depot will service all accounts in Derbyshire, Nottinghamshire, Lincolnshire, Leicestershire, Northamptonshire and Rutland.

Richard Allan Radio, Ltd. have removed to Bafflette House, Batley, Yorks (telephone: Batley 1123).

The **"Cona" Coffee Machine Co.,** is removing on 23rd July to Felden Works, Railway Place, Wimbledon, London, S.W.19 (telephone: Liberty 7277).

Mr. W. K. Lewis is now representing **Associated Technical Manufacturers, Ltd.,** in the Lancashire and West Riding area.

Annual Holidays

The works of Clang, Ltd., will be closed for the annual holidays from 22nd July to 3rd August.

The works of Runbaken Electrical Products will be closed from 23rd July to 2nd August for the annual holidays.

Dissolution of Partnership

Messrs. W. C. Crowley and W. H. Banks, carrying on business as electricians at 64, High Street, Manchester, 13, under the style of Victoria Radio & Electrical Co., have dissolved partnership. Mr. Banks will attend to debts and carry on the business under the same title.

Fatalities

Electric Iron on 30 A Fuse.—It was stated at the inquest on a six-month-old baby girl at Guildford that the fire which caused her death was started by a short circuit in the lead of an electric iron. Evidence was given that the iron was on a 30 A fuse, and the coroner, recording a verdict of "Death by Misadventure," added a warning that people should check their fuses.

Tight Kettle Plug.—The *Western Mail* reports the death of a 64-year-old widow who, it is stated, received a fatal shock while trying to ease a kettle connector with a pair of scissors.

Truvox Sales Conference

A sales conference was held recently by the Truvox Engineering Co., Ltd., twenty-six members taking part. The party was welcomed at the company's factory in Aberdare by Mr. G. R. Webster, the resident director, and made a tour of the factory, which was followed by a talk by Mr. H. D. Murdoch, joint sales manager. On the following day there were further talks by Messrs. E. Morris (field sales manager), F. J. Addington Hall, L. J. Rawling, F. Clark (chief engineer), F. W. Parker (chief inspector), C. F. Finch (joint sales manager), and L. Ward (speaker design). The social activities included a coach tour of the Welsh coast, a dinner and a staff dance.

Catalogues and Lists

W. T. Henley's Telegraph Works Co., Ltd., 51 & 53, Hatton Garden, London, E.C.1.—Technical brochure illustrating the manufacture and characteristics of 33 kV mass-impregnated cables and associated accessories.

Taylor Electrical Instruments, Ltd., Montrose Avenue, Slough, Bucks.—Catalogue and price list of electrical measuring instruments.

Morgan Crucible Co., Ltd., Battersea Church Road, London, S.W.11.—Catalogue of "Morganite" brush holders.

Aluminium Development Association, 33, Grosvenor Street, London, W.1.—Technical brochure on the behaviour of aluminium and its alloys in different fields of application over long periods.

Smiths English Clocks, Ltd., Sectric House, Waterloo Road, London, N.W.2.—Collapsible cardboard display unit for electric alarm clocks.

Claude Lyons, Ltd., 180, Tottenham Court Road, London, W.1.—Catalogue giving technical details of "Variac" variable transformers.

British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.—Technical brochure on joint box compounds.

Murex Welding Processes, Ltd., Waltham Cross, Herts.—Catalogue of welding accessories.

Electricity in Spain

Large Developments in Hand

FROM A CORRESPONDENT

IN every plan of national development in Spain the question of electricity is of paramount importance, because, with the total lack of petroleum and the scarcity of coal, Spain depends on electricity for the industrialization of the country. The electrical industry in Spain is second only to that of agriculture. Indeed, the two are closely related, since every dam that is built and every hydraulic development that is carried out can be applied in almost every case to both these vital industries.

Problem of Prolonged Droughts

When the civil war ended in March, 1939, Spanish industry began again to march forward, but with the beginning of the world war in September of the same year, supplies of British coal ceased, and this created a serious fuel and power problem. The trouble was intensified by the fact that Spain, which depends very largely on water power for her supply of electricity, suffers occasionally from prolonged periods of drought. This was the case in 1944 and 1945, and there ensued a great shortage of power which temporarily crippled the national economy.

This setback, however, gave added impetus to plans for increasing the production of electrical energy and especially for increasing the capacity of Spain's reservoirs. The Government proposed that the capacity of these should be raised from five million cubic metres to eighteen million. To-day new reservoirs with a capacity of nine million cubic metres are being constructed and projects for an additional four million cubic metres are under consideration.

Increasing Plant Capacity

Spain's total power capacity, which in 1939 was about 2,000,000 kVA, had up to the middle of 1947 increased by only 200,000 kVA, but work is now going on actively, and it is hoped that new plant will be brought into service by 1954. That Spain is capable of a rapid increase is shown by the figures for the period 1929-1935, when the total capacity rose from 1,100,000 kVA to 1,900,000 kVA. The ratio between hydro-electric and thermo-electric stations in the new development scheme will remain as at present—80 per cent to 20 per cent.

Worth mentioning among the thermo-electric plants are those being built or already erected at Ponferrada (province of Leon), burning anthracite, and the station at Puente de Garcia Rodriguez (province of Coruña), burning lignite. These two cover the north-west region and will complement another under construction at Escatron (province of Teruel, north-east Spain), and one at Puertollano in southern Spain.

The Ponferrada station will eventually develop 125,000 kVA, double the present figure. It will become one of the vital points of the national grid, supporting the hydro-electric system of the north-west, north and centre.

Fuel Policy

To the above-mentioned plants, which come under the National Institute of Industry, an official organization, must be added those being built by private enterprise at La Felguera (Asturias, north-west Spain), Aliaga (province of Teruel, north Spain), and Seville (southern Spain). Most of these new thermo-electric stations will be placed near coal mines. They will consume only low-grade coal unsuitable for other purposes. It is hoped eventually to put in reserve all existing thermo-electric stations burning high-grade coal and use them only in case of emergency. The reason for this is obvious when we remember that the Spanish mines produce only low-grade coal, so that all high-grade coal, being imported, is much more expensive.

With regard to hydro-electric production, the most important installation is that of the Iberduero Company, of Villalcampo, in the province of Zamora, north-west Spain, with a capacity of 96,000

kVA. In addition to this, several other hydro-electric stations will be operating this year. These include power stations at Las Conchas (province of Orense, north-west Spain), of 14,500 kVA; at Barazona (Huesca, north), of 28,000 kVA; at Herrerias (Santander, north), of 10,000 kVA; and at Almadenes (Murcia, east), and Fuente del Azufre (Leon, north), of 7,000 kVA each. The total increase for 1949 will be 342,350 kVA, of which 179,350 will be thermal and 163,000 hydraulic.

Among the hydro-electric works recently completed or in course of construction, the most important is the Alarcon dam (Cuenca, eastern Spain) on the river Jucar, which will provide water to important stations lying downstream. Another undertaking worthy of special mention is the dam at Tranco de Beas, on the Guadalquivir, in southern Spain.

Resources of Galicia

The plan for the production of electricity in Galicia, north-west Spain, is of the utmost importance. It will have a decisive effect on the distribution of electrical energy throughout the country, as rainfall in that province is exceptionally high. It is quite possible that, apart from making up for the deficiency in the other Spanish regions, it may allow the Spanish network to be linked up with other countries, enabling them in periods of drought to be fed from Galicia.

Much has been done to increase the production of electricity in Spain, but the demand has expanded still more rapidly. If plans had been completed, the supply would have been greater than the demand by 1948, but it is doubtful whether this ideal will be reached even by 1953, especially if projects for the electrification of the railways and agriculture are carried out. Moreover, there are several reasons for the delay in completing the development plan: lack of materials, especially copper; the world-wide time-lag in delivery; and the lack of foreign currency. It is estimated that to complete the projects prepared for the period 1947-1953, more than £20 million would be required, or over £3 million annually. That is a sum which the Spanish authorities will have difficulty in finding, especially as large amounts have to be spent in other directions, on raw materials and food.

There are some 50,000 employed in electrical engineering in Spain. Many firms have connections with well-known concerns in Germany, France and the United States, and are using their patents. They produce a good deal of heavy material, including alternators up to 10,000 kVA, motors up to 250 h.p., transformers up to 25,000 kVA and water turbines up to 3,000 h.p. The lighter side of electrical industry in Spain has made great progress. It meets the demand for dry batteries, accumulators, lamps, irons, heaters, vacuum cleaners, etc., and produces a good quantity of refrigerators.

Newer Uses of Capacitors

BESIDES indicating some of the research work now proceeding and referring to contracts completed and in hand at home and abroad, the annual review of the activities of British Insulated Callender's Cables, Ltd., mentions newer purposes for which capacitors are being used. For instance, a 2,660 μF bank, has been made for a synchrotron; the ten-cycle operating sequence, pulse controlled in synchronism with the 50 c/s input from supply mains, requires a nine-cycle charging period to 8.5 kV d.c., followed by an oscillatory discharge in one cycle. Patented double-foil electrodes screen the connecting lugs to prevent corona at high operating stress.

Capacitors for suppressing surges on the overhead d.c. conductor systems of electrified railways have to operate at 1,500 V and withstand 12 kV peaks. For a two-million-volt potential divider five 1,800 $\mu\mu$F capacitors, each to withstand d.c. at 400,000 V, have been built to fine tolerances.

For the fluorescent lighting of vehicles at low voltage and high frequency, condensers of special electrical and mechanical design are needed to withstand starting voltages and severe vibration. Capacitors with paper dielectric, hermetically sealed in ceramic tubes with soldered metal end-caps, have been introduced for radio equipment to operate in the tropics. Sizes range from 0.001 μF at 750 V to 0.5 μF at 200 V, all passing the specified 1,000 hours at 100 deg C minimum service life requirement.

Rubber Directory

A 300-page "Directory of British Rubber Manufacturers and Products" is being issued by the Federation of British Rubber Manufacturers' Associations, 43, Bedford Square, London, W.C.1.

Electricity Supply

Royal Show Installation : Hackney Plant Extensions

TO supply electricity to the 600 or so stands at the Royal Show held at Shrewsbury last week the Midlands Electricity Board laid 2,000 yd of 11 kV cable and 5,000 yd of l.v. cable, excluding services. An 11kV overhead line which passes across the showground was broken at two points to provide a duplicate feed and with the aid of a trenching machine the 11 kV cables were laid underground in the form of a ring main. At four strategic points a 500 kVA transformer, together with l.v. h.r.c. fuse units, was installed. Work on the provision of the supplies was commenced in March. Three of the ring main units were energized on 12th May and the fourth on 7th June. In addition, the Board was responsible for 38 services for the Agricultural Society and 208 services for the exhibitors. Thanks to the good work of a "fuel watcher" the load was kept well below the anticipated maximum.

Extensions at Hackney

Application has been made to the Minister of Fuel and Power by the British Electricity Authority for consent to the extension of the Millfields Road generating station, Hackney, by the installation of two 30,000 kW turbo-alternators, two 300,000 lb/hr boilers and one cooling tower. It is proposed to extend the site of the station by 9 acres.

Six Months' Output

In the first half of 1949 the output of solid-fuel fired stations of the B.E.A. and the North of Scotland Hydro-Electric Board amounted to 22,723.8 million kWh compared with 21,235.5 million in the first six months of last year. During the week ended 1st July last 708.7 million kWh was sent out, against 731.7 million in the previous week and 708.5 million in the week ended 2nd July, 1948.

Shoreham Harbour Bill

The House of Commons Select Committee considering the Shoreham Harbour Bill concluded its sitting last week. Approval was given after a new protective clause had been added. This provides that if any of the local authorities concerned considers that the coast in its area is being injuriously affected by the harbour works it can make application to the Trustees and the British Electricity Authority to make good the damage or prevent further damage. Also, the question could be referred to the Minister of Health who could cause a local inquiry to be held. The protective clause also compels the Harbour Trustees and the B.E.A. to make surveys of the shingle on the beaches. They are given permission to use or sell shingle from certain parts of Shoreham but if the local authorities consider that they are unreasonably depleting the shingle reserves the matter can be referred to the Minister of Health.

Rural Supplies

Haltwistle R.D.C. has been informed that the North Eastern Electricity Board is preparing a scheme for the electrification of much of the rural district. A joint meeting of the Council and the Board will be held to discuss the plans.

Water-Power in New Guinea

Following an investigation into the supply of electric power in New Guinea, recommendations have been made to the Australian Department of External Territories involving the construction of a large number of hydro-electric plants serving Port Moresby, Lae, Madang, Rabaul and many small centres. The largest plant will be of about 3,000 kW.

West Scotland Extension

The S.W. Scotland Electricity Board has approved a scheme for the supply of electricity to Wanlockhead and Meadowfoot, Dumfriesshire, and Leadhills, Lanarkshire, at an estimated cost of about £12,000. More than 300 households will receive electricity for the first time.

Progress at Cliff Quay

The first generator and two boilers at the new Cliff Quay power station, Ipswich, have been in operation periodically during the past two months, a second set is nearly ready, and a third should be in commission in time for next winter, representing half the total capacity.

Development in Eire

Moving the second stage of the Electricity Supply (Amendment) Bill, 1949, in the Senate recently, Mr. Cosgrave, Parliamentary Secretary to the Ministry for Industry and Commerce, explained that the Electricity Supply Board's estimate of the capital required for its projected programme up to 31st March, 1952, amounted to £29,500,000, after allowing for £12,500,000

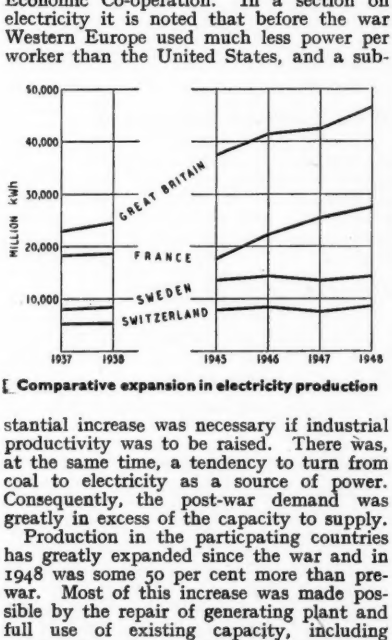
already sanctioned. The total requirements included £18,783,000 for generation; £12,440,000 for transmission and distribution; £2,762,000 for general work; £15,000 for Shannon fisheries; and £8,000,000 for rural development.

Senator Hawkins, expressing the sentiments of most of his colleagues, welcomed the Bill. He urged a thorough investigation into the present organization, and said that it was necessary to study the possibility of providing cheaper power for industry. Senator R. E. Richards Orpen stressed the importance of obtaining the fullest information. While not casting any reflection on the efficiency of the Board, he thought that they should carefully examine the charges for electricity.

Replying to the debate, Mr. Cosgrave stated that, generally speaking, the charges were 40 per cent higher now than in 1939, which compared favourably with other commodities.

European Power Position

THE progress of Western European recovery is surveyed in a report just published by the Organization for European Economic Co-operation. In a section on electricity it is noted that before the war Western Europe used much less power per worker than the United States, and a substantial increase was necessary if industrial productivity was to be raised. There was, at the same time, a tendency to turn from coal to electricity as a source of power. Consequently, the post-war demand was greatly in excess of the capacity to supply.



Comparative expansion in electricity production

Production in the particpating countries has greatly expanded since the war and in 1948 was some 50 per cent more than prewar. Most of this increase was made possible by the repair of generating plant and full use of existing capacity, including arrangements for international transfer of power. Such transfers are at present being made between Austria, the Bizone of Germany, Italy, France, "Benelux" countries and Switzerland, while additional lines are projected or under construction between Italy and France, Benelux and the Bizone, France and Benelux, and Sweden and Denmark. This has involved considerable investment but has yielded quick returns. Nevertheless, this has not been sufficient to meet the demand and at the end of 1948, when the participating countries had a net capacity of 44,800,000 kW, there was an estimated shortage of 8,500,000 kW.

Electricity Production in Thousand Million kWh

Country	1938	1947	1948
Austria	1.9†	3.2	4.2
Belgium-Luxemburg ...	5.7*	7.6*	8.4*
Denmark	0.8	1.3	1.6
France	18.6	25.3	27.5
Bizone	—	16.2	18.9
French Zone excl. Saar ...	2.6†	1.9	2.4
Ireland	0.4	0.6	0.7
Italy	13.1*	17.9*	19.2*
Netherlands	2.4	3.4	4.1
Norway	9.6	11.3	12.2
Portugal	0.4	0.7	0.8
Sweden	9.2*	13.5*	14.1*
Switzerland	5.4	7.8	8.8
Turkey	0.3	0.6	0.6
Gt. Britain...	24.4	42.6	46.5

Electricity generated by public utilities unless otherwise stated; last quarter 1948 partly estimated. *Includes production of establishments generating for own needs. † Rough estimate based on C.E.E.C. Paris Report, including private production.

Storing Seed Potatoes

SEED potatoes are usually stored in "clamps." This method, however, is not entirely satisfactory as the potatoes lose much of their nutriment owing to the formation of long sprouts, which have to be removed. The presence of light has been found to check this sprouting and in many places glass storage arrangements have been employed. As this method also has its disadvantages, investigations are being carried out in an endeavour to find a more efficient manner of storing.

In the April issue of the *Philips Technical Review* an experiment is described in which seed potatoes are stored in an artificially lighted cellar. It has been found that fluorescent lamps are much better than incandescent lamps for checking sprouting. It is suggested that this may not be ascribed to destruction of the auxin in the tubers, which takes place mainly through blue light. A closer investigation indicates that red light has a much stronger checking effect than blue light. These experiments lead one to suppose that mainly or exclusively through red light, an inhibitor is developed in the potato.

FINANCIAL SECTION

Company News
Stock Exchange Activities

Reports and Dividends

Aberdare Cables, Ltd.—The annual meeting was held on 1st July. In his statement which accompanied the report and accounts, Sir George Usher (chairman) says that due to reorganization and setting up of new machinery in Area Electricity Boards, there has been some delay in the receipt of inquiries and orders, but the company has obtained substantial contracts. The demand for cables in the home market should continue at a high level for some years to come. If, however, the cable industry is to continue on a healthy basis, it is essential that the primary raw materials —of which copper and lead form the greater part—should fall substantially, and it is important that the Government should appreciate that the price of these two basic materials should be reduced to world price level as soon as possible.

There has been a recession of orders from many of their overseas territories since the early part of 1948. This loss of business is due to the difficulty of obtaining import licences in overseas territories, owing to the shortage of foreign currency in many countries, and is particularly aggravated by the low prices being quoted by German, Italian and Japanese cable makers, who have longer hours and lower rates of pay. The factory of their associated company, Aberdare Cables of South Africa, Ltd., Port Elizabeth, is now in full production, and they have obtained substantial business from the South African electrical undertakings and mines, as well as important contracts from surrounding African territories. The year under review has been an unfortunate one for their subsidiary, South Wales Switchgear, Ltd. The period commenced with a large order book for electrical domestic equipment to meet the requirements of the Government housing programme, but the Government suspended all deliveries of these articles with serious repercussions on their manufacturing programme. The order book of this company for other equipment such as switchgear for the B.E.A. and other authorities, together with a large volume of work for the export market, is satisfactory.

The Hackbridge & Hewittic Electric Co., Ltd., reports a group trading profit for the year ended 31st March last of £210,955, as compared with £176,722 for the preceding year, to which is added sundry income of £3,008. After providing for depreciation, taxation, etc., the net profit is £74,310 (against £52,995), which with £27,055 brought in, makes £101,365 available. General reserve receives £30,000 and it is proposed to pay a final ordinary dividend of 8½ per cent, making 12½ per cent for the year (against 12 per cent). The balance carried forward is £27,728.

Mr. T. F. Lister (chairman and managing director), in his statement which accompanies the report and accounts, says that there has been a steady increase during the year in the output of all departments. Good progress is being made with the extensions of the factory at Hersham; the first section was brought into use at the beginning of June and it is expected that the remaining section will be completed and in use by the end of October. More than one-third of their output has been exported, and the volume of orders from outside Great Britain continues at a high level.

Orders on hand for the group are again a record. The transformer department has a heavy programme in hand for the British Electricity Authority. The outstanding feature of the rectifier department has been the demand from overseas, and they have on hand a bigger proportion of orders for overseas than at any time in their history. The output from the switchgear department again shows an expansion on recent years and development work is being carried out on a number of new applications which will enlarge the range of products in this department.

E. K. Cole, Ltd.—In the course of his speech at the annual meeting held on 4th July, Mr. E. K. Cole (chairman and managing director) said that during the period under review trading conditions in the radio division became difficult due to diminution of spending power at home and the unsettling effect on buying of recurring fluctuations in purchase tax. Their sales of television receivers had steadily increased. Efforts had been continued within the organization to reduce manufacturing costs, and they had been able to launch a new popular range of television sets. They had felt the effect of the limitation of imports made by many overseas countries, but had succeeded in maintaining their export turnover by concentrating on the development of those markets which were still accessible and by opening up new channels of distribution wherever possible. In addition they had gained valuable footholds in export markets in respect of certain of the specialized products of their electronics division. The scope and extent of this division's work had greatly increased and it had been entrusted with a great deal of work for the

armed forces and departments of the Government and for Commonwealth Governments. Their subsidiary, Ekco-Ensign Electric, Ltd., had been confronted with problems similar to those which prevailed in the radio industry. The expected steady increase in the sales of fluorescent lighting fittings in the industry did not materialize owing to the deterioration in the economic position and the Government's direction to industry to limit capital expenditure.

In furtherance of their export policy and to overcome import restrictions, they had entered into an arrangement with the Tata group of companies for the manufacture of radio apparatus in India, and a similar arrangement had been concluded with African Incandescent Lamps (Pty.), Ltd., for the manufacture of electric lamps in South Africa. In conjunction with Kelly & Shiel, Ltd., they had also established a factory in Ireland for radio manufacture in that country. Consent had been obtained from the Treasury to the increasing of their capital, but the directors had decided to defer making a new capital issue for the time being.

The Harland Engineering Co., Ltd., reports a net profit for 1948 of £46,088, as compared with £29,921 for the preceding year, to which is added £16,160 brought in. The ordinary dividend for the year is unchanged at 7 per cent, less tax, and £17,098 is carried forward.

In his statement which accompanies the report and accounts, Mr. H. Cowan-Douglas (chairman) says that their water turbine orders are largely for the North of Scotland Hydro-Electric Board, but they also include a substantial element of export work. Among home orders is included a large contract in respect of a new pumping installation for the Metropolitan Water Board, and contracts for auxiliary equipment for many of the new power stations being erected for the British Electricity Authority.

The British Vacuum Cleaner & Engineering Co., Ltd., held its annual meeting on 7th July, when Mr. H. C. Booth (chairman) said that 1948 opened with a full order book covering most of their manufactures, but, unhappily, the results for the year failed to reflect all the expectations with which it started. Their trading profit for the year was slightly in excess of that of 1947, and turnover was the highest of any normal trading year, and but for the serious setback following the 1948 Budget which affected most sections of the domestic electric appliance industry, they would have shown appropriate increase in their net revenue. The industrial sales had considerably developed, and in its various sections the industrial side was now in balance with the domestic side, which made them less vulnerable to market changes. Their new subsidiary, B.V.C. Electronic Developments, Ltd., was engaged in development work in the field of electronics which it was hoped might have useful results. The combined results of their subsidiary companies during the last year had for the first time for many years shown a loss. This largely arose from restrictions of trade partly caused by the Canadian Government embargo put into operation during the year under review. These condition had largely been eased and operations were now back on a profitable basis. There was a considerable recession in trade in the pre-Budget period this year, which temporarily had a considerable adverse effect on their revenue-earning capacity, although all sections of their business were working at a healthy level and the business during the last three honths had been by far the highest in their history.

The Electric Construction Co., Ltd.—The financial results of this company for the year ended 31st March last were reported in our issue of 1st July. In his statement, which accompanies the reports and accounts, Mr. W. M. Furniss (chairman and managing director), says that owing to the unsettled state in China, the imposition of a ban on imports in some countries, and other contingencies, there is a possibility of losses and additional expenditure being incurred on plant already manufactured or in the process of manufacture, and it has therefore been considered desirable to provide a further £24,762 for contingencies. The directors look forward to the current year's operations with optimism, though the new ban on imports into South Africa may have a serious effect on their exports in that country, which constitute a considerable proportion of their export business.

Broadcast Relay Service, Ltd.—Speaking at the annual meeting held on 8th July, Mr. J. S. Wills (chairman) said that they had added large numbers of new subscribers to their rediffusion services at home. Their manufacturing activities had once more achieved a record year of output, and despite signs of slackening in orders for manufactured products generally, they finished the year with a heavier order book for their products. In addition to communication equipment and radio heating they were now re-entering, on a peace-time basis, the field of manufacture of special equipment for aeronautical applications. With regard to overseas services they started rediffusion in Hong Kong in March last, and a service was planned to start this month in Singapore, to be followed soon by a service in Kuala Lumpur. Plans were being put into prac-

tice to introduce rediffusion into the American Continent.

Cawnpore Electric Supply Corporation, Ltd.—The profit and loss account for the period 16th September, 1947, to 31st December, 1948, shows a balance brought in of £72,454. From this is deducted £34,392 expenditure in respect of the period from September, 1947, and £9,109 is added from interest on dividends, etc., making £47,172. After providing for management and general charges, debenture interest, preference dividends for 18 months, etc., a balance of £15,922 is carried forward.

The directors state that steps will be taken to place the company in liquidation when the position is clearer in regard to the valuation of the assets taken over by the United Provinces Government and the pending suit against that Government in the High Court in Allahabad.

Telephone Rentals, Ltd., reports a net profit for 1948 of £322,034, as compared with £264,381 for 1947. The final dividend is 6 per cent, again making 10 per cent for the year.

The Revo Electric Co., Ltd., reports a trading profit for the year ended 31st March last of £348,987, as compared with £540,554 for the preceding year, to which is added interest on tax reserve certificates £750, and provisions not required £7,842, making £357,579. After providing for depreciation, taxation, etc., there is a balance of £153,775 (against £230,714). General reserve receives £50,000 and plant replacement reserve £30,000. The dividend for the year is 17½ per cent (same) and the bonus of 10 per cent is also repeated. The balance carried forward is £148,196 (against £135,006 brought in).

Greenwood & Batley, Ltd., report a trading profit for the year ended 31st March last of £123,035, as compared with £121,345 for the previous year, and a net profit of £44,261 (against £40,904). Reserve receives £10,000 and it is proposed to again pay an ordinary dividend for the year of 15 per cent. The balance carried forward is £72,577 (against £70,924 brought in).

Murex, Ltd., proposes to capitalize £1,000,000 of its reserves and to issue to ordinary stockholders one fully paid ordinary share of £1, to be converted into stock, for each £1 unit of ordinary stock held. The issue is subject to consent of the Treasury and the approval of stockholders.

The Electric & General Investment Co., Ltd., reports a profit for the year ended 31st May last of £5,659, as compared with £5,153 for the previous year. The dividend is maintained at 15 per cent for the year and £20,398 is carried forward.

New Companies

Farmer Electrical Co., Ltd.—Registered 11th June. Capital £1,000. To acquire the business of electrical engineers carried on at Smethwick as Farmer & Co., and to enter into an agreement with T. A. S. Farmer and A. W. Goodwin. Solrs.: Hawkins & Co., Dudley. Regd. office: 124, Milcote Road, Bearwood, Smethwick.

Blackpool Armature Winding Co., Ltd.—Registered 14th June. Capital £1,000. Electrical engineers and contractors, manufacturers of implements and machinery, etc. Directors: A. Hargreaves and E. McGrath. Secy.: E. G. Brewer. Regd. office: 146, Talbot Road, Blackpool.

Hancox & Co. (Leyton), Ltd.—Registered 14th June. Capital £2,000. To acquire the business of electrical contractors and mechanical engineers carried on by H. W. Hancox and W. Sears at Leyton as Hancox & Co. Permanent directors: H. W. Hancox and W. Sears. Secy.: C. E. Wilmot. Regd. office: 203, Church Road, Leyton, E.

Centurion Tubes, Ltd.—Registered 22nd June. Capital £10,000. To acquire the business of 20th Century Electronics carried on by G. A. R. Tomes and E. E. Shelton at Dunbar Street, S.E.27. Permanent directors: G. A. R. Tomes and E. E. Shelton. Secy.: S. A. Reed. Regd. office: Dunbar Works, Dunbar Street, West Norwood, S.E.27.

Liquidations

Em-Vee (Productions) Co., Ltd.—Winding up voluntarily. Liquidator, Mr. D. C. Don, 37, Norfolk Street, London, W.C.2, appointed 1st July.

East British Electric Co., Ltd.—Meetings of members and creditors on 9th August at 211, Lower Addiscombe Road, Croydon, Surrey, to receive an account of the winding-up by the liquidator, Mr. W. English.

Bankruptcies

E. D. S. Munday, carrying on business at 272, Lake Road, Portsmouth, electrical engineer.—Application for discharge to be heard on 4th August at the County Court, Ashburton Road, Kent Road, Portsmouth.

D. H. Mannion, electrician, carrying on business under the style of D. H. Mannion & Son, at 9, Regent Street, Haslingden, Lancs.—Trustee, Mr. F. C. Ormrod, 20, Byrom Street, Manchester, 3, Official Receiver, released 1st July, 1949.

R. L. Newell, trading as R. & R. Newell, High Bank Mill, Egremont, Cumberland, electrical engineer.—Trustee, Mr. T. B. Harston, 14, Lowther Street, Carlisle, Official Receiver, released 30th June, 1949.

STOCKS and SHARES

STOCK EXCHANGE markets and prices are moving in erratic fashion. On tendency, as the House says, the disposition is dullish, owing largely to the dockers' strike and the State of Emergency. Money remains coy of entering the markets, but the existence of a fair-size bear account round the House serves to maintain quotations up to a point.

The Government offers no encouragement either to investor or speculator. Uncertainty persists in regard to what is likely to happen after the interval of the three months which end next September. Suspense must obtain at any rate until then.

Company Reports

Revo Electric's full accounts show that despite lower profits the net surplus of £154,000 available for distribution covers the 27½ per cent dividend with nearly £100,000 to spare for reserves, which now exceed by far the issued capital of £367,500, all of which is in 10s ordinary shares, quoted at 47s 6d to yield 5¾ per cent. Hackbridge & Hewittic's figures give group earnings of 27 per cent to cover the 12½ per cent paid. At 11s the shares have come under the influence of the proposed capital issue: they pay £5 13s 9d per cent on the money. The report of the chairman speaks of continuously heavy demands on the company's capacity.

Electric Construction

The price of Electric Constructions has been as high as 57s this year and the present quotation of 50s cum dividend is the lowest touched in 1949, affording a return of 5 per cent on the money. At the meeting to be held on 29th July, the chairman will have pleasant figures to discuss. His preliminary statement, however, points out that difficulties lie ahead in the shape of the ban imposed upon imports to South Africa, as well as troubles in China and other countries. The consolidated balance sheet reveals a very satisfactory condition of liquidity.

New Issues

Babcock & Wilcox new ordinary shares are now on the market, at a premium of about 6d on the price of 57s 6d at which they are offered to shareholders. The old shares, now 57s 6d ex-rights to the offer, have been over 75s this year, and were 65s before reference was made to the issue at last month's annual meeting. (Temporary market depression seems to be the inevitable accompaniment, at present, to a call for fresh capital. These occasions are welcome, at least, to the potential investor.) In this case, the buyer of shares in the form of renounced allotment letters saves himself nearly 1s per share in transfer stamp, and, on the depreciated price, sees a prospective yield of £5 3s 6d per cent—a respectable return, even now, from a first-class industrial.

Enfield Cables' New Shares

As with Babcock & Wilcox, so with the issue of Enfield Cables' new shares. The existing ordinary were 34s 6d before the mention of new capital a month ago, and are now 28s 9d. The new shares, offered at 27s 6d, stand at 6d premium and will be free of transfer stamp duty to the buyer until the 21st of this month. They yield over 5¼ per cent, assuming maintenance of the 7½ per cent dividend, which was last paid from group earnings of nearly 30 per cent on the old capital. The return is a full 1 per cent above the yield on some others in the cable-manufacturing group.

Pye Dividends

Pye, Ltd., have a profit-sharing scheme under which any increase in the dividend is accompanied by the distribution of an equal amount to employees. For the last two years the latter have received, on this account, sums of £12,500 and £16,000. In compliance, however, with the dividend limitation agreement, and with a ruling on this occasion from the Chancellor, equal sums for the deferred shareholders have been frozen in a reserve account. Next year, states the company, the dividends will be unfrozen, provided that the figures justify the step. The 1948 accounts showed earnings well maintained, leaving an ample surplus for improvement, as the directors intended, in the long succession of 25 per cent dividends. The 5s. shares remain at 22s 6d, yielding 5½ per cent at that price.

The Week's Price Changes

In spite of everything, this week's record of price changes is slightly in favour of the holders of shares. Lucas, for instance, are 2s 6d better at 70s. Cable & Wireless preference at 112½ and the ordinary at 230½ are up by 4 and 10 points respectively. Murex 93s 9d, and Telegraph Construction 47s 6d, gained 1/6 each. Henley's hardened to 23s 6d, Burco to 18s 3d, Decca to 14s. British Electric Traction deferred at 1575 is 70 points higher. On the other hand, what falls there are have no particular significance. Automatic Telephone at 59s 6d are down 1s, and Heatrae at 4s are similarly easier. Plessey declined to 13s 9d. Ever Ready 27s 6d., Scottish Cables 22s 6d, Laurence Scott 12s 9d, and Marconi Marine 24s 6d., have lost 6d each.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1944

19606. British Thomson-Houston Co., Ltd.—Filament mountings. 11th October, 1943. (625,007.)

23342. British Thomson-Houston Co., Ltd. and Pohl, R. A.c. generators. 23rd November, 1944. (625,248.).

1945

2638. British Thomson-Houston Co., Ltd.—Pressure gauges. 7th February, 1944. (625,249.)

6299. Marconi's Wireless Telegraph Co., Ltd., Clough, N. H. and Oliver, E. C.—Signalling systems. 13th March, 1945. (625,250.)

10532. British Thomson-Houston Co., Ltd.—Methods of and apparatus for bending glass tubes. 27th April, 1944. (625,088.)

21558, 21700 and 21701. British Thomson-Houston Co., Ltd.—Washing machines. 25th August, 1944. (625,324-6.)

27166. Akt.-Ges. Brown, Boveri & Cie.—Laminated sintered body for use in electrical apparatus. 7th February, 1945. (625,010.)

28245. Pennybacker, M.—Gas-discharge lamp. 23rd December, 1944. (625,256.)

1946

2966. Stevens, A. H. (Submarine Signal Co.).—Electromagnetic interruptors or vibrators. 30th January, 1946. (625,017.)

3189. Bowker, J. W.—Illuminated signs. 31st January, 1946. (625,103.)

5272. Stevens, A. H. (Goder Co.).—Electric welding apparatus. 20th February, 1946. (625,018.)

5608. General Electric Co., Ltd., and Biggs, A. J. —A.c. bridge circuits. 22nd February, 1946. (625,021.)

6449. Standard Telephones & Cables, Ltd.—Electron-discharge devices of the velocity modulation type. 22nd December, 1943. (625,259.)

10341. Aktieselskabet Fisker & Nielsen.—Joints for use in securing tube members or the like, associated with vacuum cleaners. 8th December, 1941. (625,022.)

11543. Marconi Instruments, Ltd., and Brockelsby, C. F.—Wheatstone bridge measuring and computing devices. 15th April, 1946. (625,023.)

11544. Marconi Instruments, Ltd., Brockelsby, C. F., and Todd, W. A. H.—Instruments for measuring moisture content in wool and other substances. 15th April, 1946. (625,024.)

12569. Rigert, E.—Arrangements in automatic telephone networks for the establishment of connections. 25th April, 1946. (625,025.)

14966. Igranic Electric Co., Ltd.—Means for rendering an electro-responsive device responsive to load on an induction motor. 19th May, 1945. (625,030.)

15039. Electrical Steam & Mining Equipment (London), Ltd., and Couling, C. W.—Means for the remote positional control of apparatus. 12th June, 1947. (625,261.)

15067. Compagnie Générale de Telegraphie sans Fil. —Velocity-modulated electronic valves. 16th May, 1941. (625,031.)

16616. Morton, H. J.—Electrically heated radiators. 17th January, 1946. (625,114.)

18812. Goodrich Co., B. F.—Electrically heated protective covering and method of making the same. 3rd July, 1945. (625,116.)

19378. Philips Lamps, Ltd.—Electric-discharge tube containing a secondary-emission electrode. 16th May, 1942. (625,263.)

19544. Pearson, J.—Supports for electric-discharge lamps. 1st July 1946. (625,117.)

19711. Marconi's Wireless Telegraph Co., Ltd.—High-voltage power supplies. 2nd July, 1945. (625,265.)

20089. Berger & Sons, Ltd., L., Vroome, H. C. de, and Wakeford, L. E.—Method for the manufacture of impregnated electrical windings.—3rd July, 1947. (625,039.)

20926. British Thomson-Houston Co., Ltd.—Clothes washing machines. 13th July, 1945. (625,328.)

21540. Philips Lamps, Ltd.—Circuits for modulating the frequency or the phase of electrical oscillations. 25th February, 1943. (625,268.)

22554. Smith, R. A. (Breeze Corporations, Inc.):—Connectors for electric conductors. 29th July, 1946. (625,269.)

22956. Metson, G. H. Electronic valve devices. 1st August, 1946. (625,271.)

23299. British Thomson-Houston Co., Ltd.—Thermal responsive actuating means applicable for example to electric switches. 6th August, 1945. (625,272.)

23312. Sylvania Electric Products, Inc.—High-frequency wave signalling systems. (14th February, 1942. (625,121.)

24154. Westinghouse Electric International Co.—Magnetrons. 28th August, 1945. (625,275.)

25582. Standard Telephones & Cables, Ltd., and Hellier, W. H. M.—Visual indicators. 27th August, 1946. (625,049.)

26219. Siemens Bros., & Co., Ltd., Clark, R. I. H., and Stallworthy, F. A.—Telephone systems. 30th August, 1946. (625,276.)

26830. General Electric Co., Ltd., and Ollerenshaw, C.—Power supply means for electric circuits comprising thermionic apparatus. 6th September, 1946. (625,127.)

26831. General Electric Co., Ltd., and Ollerenshaw, C.—Means for controlling the operation and release of electro-magnetic relays. 6th September, 1946. (625,128.)

27201. British Insulated Callender's Cables, Ltd., and Kretschmer, J. M. (Legal representative of Kretschmer, H. E., deceased).—Insulated electric wires. 10th September, 1946. (625,051.)

27439. Lobstein, J. Electric flat-irons. 1st August, 1941. (625,052.)

28014.—Standard Telephones & Cables, Ltd., and Burtt, K. M.—High-frequency heating apparatus. 18th September, 1946. (625,054.)

28040. Steghart, F. L.—Apparatus for measuring and controlling radiant light or heat energy. 18th September, 1946. (625,282.)

28255. Philips Lamps, Ltd.—Rectifying electric-discharge tubes. 6th March, 1943. (625,283.)

28440. British Thomson-Houston Co., Ltd., and Scott, W. J.—Methods of sealing metal tubes. 23rd September, 1946. (625,132.)

29300. Aktiebolaget Svenska Elektron-Ror, and Backmark, N. E. G.—Electron-discharge tube. 2nd October, 1946. (625,056.)

30547. McMillan, A., and Mitchell, J. T. D.—Voltage regulators. 14th October, 1946. (625,136.)

32090. Philips Lamps, Ltd.—Cathode-ray oscillographs. 27th April, 1943. (625,138.)

32786. Metcalfe, C.—Vacuum cleaners. 5th November, 1946. (625,140.)

33045. Phillips Lamps, Ltd.—Mains hum reduction in apparatus for transmitting electrical oscillations. 9th November, 1945. (625,063.)

33140. British Thomson-Houston Co., Ltd., and Bocock, W. A.—Microphones. 7th November, 1946. (625,291.)

33294. Hardwick, B.—Electric timing switches. 8th November, 1946. (625,141.)

34730. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Call-signal reception in carrier-wave telephony systems. 12th June. 1943. (625,067.)

35465. Standard Telephones & Cables, Ltd., Thornton, A. M., Prior, H. T., and Goullee, S. J.—Carrier current transmission systems. 29th November, 1946. (625,294.)

36302. Morey, G. H.—Electric heaters and methods of manufacturing same. 5th July, 1946. (625,296.)

36308. Electrolux, Ltd.—Vacuum cleaner nozzles and brush attachments therefor. 15th December, 1945. (625,072.)

36999. Philips Lamps, Ltd.—Circuit-arrangements for the frequency stabilization of modulated electrical oscillations. 14th October, 1943. (625,147.)

37132. Sunderland Forge & Engineering Co., Ltd., and Davison, J. W.—Electric telemotor apparatus. 17th December, 1946. (625,149.)

37903. Wilcolator Co.—Automatic changeover relay system for supplying current from a spare current source upon failure of current supplied from a main current source. 21st August, 1945. (625,298.)

1947

271. Metropolitan-Vickers Electrical Co., Ltd., and Scoles, G. J.—Control apparatus for cathode-ray tubes. 3rd January, 1947. (625,165.)

728. General Electric Co., Ltd., and Judson, A. E.—Telephone instruments. 9th January, 1947. (625,078.)

1907. Philips Lamps, Ltd.—Control systems for X-ray tubes. 17th November, 1943. (625,156.)

3025. Morphy-Richards, Ltd., and Rutter, F. G.—Handles for electric suction cleaners. 31st January, 1947. (625,300.)

3114. Broadway, L. F.—Cathode-ray tubes. 1st February, 1947. (625,302.)

3201. Morphy-Richards, Ltd., and Morphy, D. W.—Handles for carpet sweepers and suction cleaners. 3rd February, 1947. (625,303.)

4537. M-O Valve Co., Ltd., Andrews, D., and Windsor, L. R. E.—Cooling of electric-discharge devices. 17th February, 1947. (625,179.)

4563. Radio Corporation of America. — High-frequency devices for heating or bonding thermoplastic materials. 15th February, 1946. (625,180.)

4855. Metropolitan-Vickers Electrical Co., Ltd., and Scoles, G. J.—Electronic timing circuits. 19th February, 1947. (625,182.)

5572. Philips Lamps, Ltd.—Method of exhausting and closing vessels such as electric-discharge tubes. 25th May, 1944. (625,186.)

6005. General Electric Co., Ltd., Wells, G. M., and Rollin, L.—Mounting of piezo-electric crystals. 3rd March, 1947. (625,188.)

6086. Revo Electric Co., Ltd., and Felton, A. E.—Lamp reflector fittings. 4th March, 1947. (625,307.)

6763. General Electric Co., Ltd., and Jacoby, H. C. E.—Machines for winding coils for dynamo-electric machines and the like. 11th March, 1947. (625,190.)

7070. E.M.P. Electric, Ltd., and Humphreys, I. E.—Cartridge fuses. 13th March, 1947. (625,308.)

8528. English Electric Valve Co., Ltd., and Esterson, M.—Manufacture of electric-dischange devices. 28th March, 1947. (625,195.)

8634. Philips Lamps, Ltd.—Networks for the transmission of electrical oscillations. 6th July, 1944. (625,197.)

8918. Johnson, Matthey & Co., Ltd., Kerridge, F. E., and Coombs, T. L.—Electrical resistors. 2nd April, 1947. (625,198.)

9197. Radio Corporation of America.—Electric condensers. 5th April, 1946. (625,199.)

10874.—Electrolux, Ltd.—Current supply regulating devices for electric motors. 26th April, 1946. (625,205.)

12447. Combi, A.—Electrical multi-circuit-breakers.—8th May, 1947. (625,341.)

13108. Cinema-Television, Ltd., and Lance, T. M. C.—Cathode-ray tubes and the like and methods of manufacturing such tubes.—15th May, 1947. (625,214.)

14994. Standard Telephones & Cables, Ltd.—Inductive coupler. 14th November, 1945. (625,217.)

15035. Carlton, J.—Electrically heated gloves or the like for heat treatment of the hands. 6th June, 1947. (625,218.)

15215. Plessey Co., Ltd.—Electromagnetic interrupters. 11th June, 1946. (625,219.)

16650. General Electric Co., Ltd., and Clayton, R. J.—Frequency changers for electrical oscillations. 24th June 1947. (625,358.)

17024. Western Electric Co., Inc.—Electrical oscillation generators. 17th January, 1942. (625,360.)

17850. Etablissements Merlin & Gerin.—Arc extinguishing devices acting by means of gaseous fluid for high-voltage a.c. circuit-breakers. 25th March, 1939. (625,236.)

17893. Hazeltine Corporation.—High-voltage power-supply system. 1st July, 1946. (625,238.)

19637. British Thomson-Houston Co., Ltd.—Electric capacitors and dielectric compositions therefor. 24th July 1946. (625,366.)

19877. Carr Fastener Co., Ltd., and Heath, C. W.—Holders for thermionic valves, plugs and other electrical devices having projecting contact pins. 24th July, 1947. (625,368.)

19913.—Scottish Cables, Ltd., Fraser, W., and Hastie, J. S.—Electric transmission systems. 24th July, 1947. (625,370.)

19916. British Thomson-Houston Co., Ltd.—Ceramic seals and method of making same.—24th July, 1946. (625,371.)

20097. Sperry Gyroscope Co., Inc.—Ultra-high-frequency electromagnetic wave-measuring arrangements. 18th August, 1943. (625,378.)

20137. Western Electric Co., Inc.—Electric-discharge tube amplifiers. 1st May, 1941. (625,379.)

20237. Rotax, Ltd., and Thomson, R. H.—Snap-action electric switches. 28th July, 1947. (625,386.)

20240. Spencer, A., and Good, G.—Frequency relays for alternating currents. 28th July, 1947. (625,387.)

20270. Standard Telephones & Cables, Ltd.—Multiple spring contact plug-and-jack connectors. 5th February, 1946. (625,388.)

20450. Sharman, G. A., and Holman, R. E.—Construction of small synchronous electric motors. 29th July, 1947. (625,395.)

20798 Westinghouse Electric International Co.—X-ray tubes. 27th June, 1940. (625,401.)

20808. General Electric Co., Ltd., and Cover, W.—Electrical apparatus for soil warming. 31st July, 1947. (625,402.)

20838. Steen, C. A.—Multiphase electrodes. 31st July, 1947. (625,403.)

27077. E.M.P. Electric, Ltd., and Humphreys, I. E.—Powder-filled high-rupturing capacity fuses. 8th October, 1947. (625,317.)

Trade Marks

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month from 6th July.

ACETRON. No. 668,012, Class 9. Mercury-vapour convertors, being electronic apparatus.—Ateliers de Constructions Electriques de Charleroi Société Anonyme, Brussels, Belgium.—Address for service: c/o Feeny & Feeny, 2a, Charlwood Place, Westminster, London, S.W.1.

PHOTICON. No. 674,180, Class 9. Pick-up tubes, iconoscopes, monoscopes and image-convertor tubes, all being parts of television apparatus and television cameras.—Cathodeon, Ltd., Radio Works, St. Andrews Road, Cambridge.

BRIMISTOR.—No. 674,403, Class 9. Temperature-dependent electric resistances, temperature indicators, temperature regulators; electric control apparatus embodying temperature-dependent electric resistances; and electric current rectifiers and electric current amplifiers.—Standard Telephones & Cables, Ltd., Connaught House, 63, Aldwych, London, W.C.2.

BETA. No. 665,933, Class 11. Electric fires, radiators and heaters, and parts of all the aforementioned goods included in Class 11.—British Emulsifiers, Ltd., 12, Greek Street, W.1.

ELECTRIC HOSTESS (design). No. 672,060, Class 11. Trolleys or portable apparatus incorporating electrically heated receptacles for keeping foods warm.—L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, Kingsway, W.C.2.

CONTRACT INFORMATION

ACCEPTED TENDERS AND PROSPECTIVE ELECTRICAL WORK

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Banbury.—27th July. R.D.C. Wiring and fittings for fifty-four houses on six sites. A. Hunt, surveyor, Castle Wharf.

Bedford.—18th August. R.D.C. Two sets of electrically driven vertical sewage pumps. John Taylor & Sons, engineers, Artillery House, Westminster, London, S.W.1.

Belfast.—5th August. Electricity Department. Fire-resisting doors and steel doors. (See this issue.)

Egypt.—CAIRO.—23rd August. Electrical and Mechanical Section, Municipalities Department. Water-cooling tower, artesian well, power transformers, air exhausters, pumping sets, etc., for the Assiut municipal power station. (C.R.E. (I.B.) 18907/49. Ten/488.)*

Glasgow.—25th July. Corporation. Six sets of electrically driven centrifugal pumps for new pumping station in the Castlemilk area. S. D. Canvin, general manager, Water Department, City Chambers.

Halifax.—22nd August. Education Committee. Renewal of the electrical installation at the Crossley and Porter Schools, Savile Park. C. E. Gent, chief education officer, West House.

India.—NEW DELHI.—5th August. Directorate General of Industries & Supplies. Electric jib cranes, mobile cranes and overhead travelling cranes. (C.R.E. (I.B.) 18442/49. Ten/483.)*

Merton and Morden.—25th July. U.D.C. Fluorescent lighting scheme at Central Library. (See this issue.)

Newburn-on-Tyne.—U.D.C. Electric wiring of 100 houses at Westerhope and 12 at Throckley. J. A. Weatherley, surveyor, Council Offices, Newburn.

New Zealand.—WELLINGTON.—27th July. Post and Telegraph Department. Supply of eighteen dynamotors. (C.R.E. (I.B.) 17764/49. Ten/482.)*

South Africa.—DURBAN.—16th September. City Electricity Department. E.h.v. switchgear for nine substations. (C.R.E. (I.B.) 18141/49. Ten/480.)*

Southern Rhodesia.—BULAWAYO.—14th October. Switchgear and transformers. (C.R.E. (I.B.) 18119/49. Ten/484.)*

Uganda.—1st August. Electricity Board. Switch-fuse gear, motors and starters, domestic apparatus, lamps, cables and wiring materials. (8th July.)

Wembley.—25th July. Borough Council. Electrical work in connection with war damage repairs to Vale Farm Swimming Pool, Watford Road. Borough engineer, Town Hall.

* Specifications may be inspected at the Commercial Relations and Exports Department, Thames House North, Millbank, S.W.1.

Orders Placed

London.—L.C.C.—Electrical installation at Friern Road School.—Samuel Reed & Sons, Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashby-de-la-Zouch.—Houses (28), Donisthorpe site, for R.D.C.; Gee, Walker & Slater, Ltd., Uttoxeter Old Road, Derby.

Bangor.—Flats (46); Henry Jones & Sons, Beach Road, Rhosneigr, Anglesey.

Office block, junction of Glynn Road and High Street; city surveyor.

Barnet.—Junior and infants' school, Whitings Hill (£69,350); county architect, Hertford.

Barking.—Flats (118), Longbridge Road; borough architect.

Bexhill.—Houses (20), Ninfield Road estate; for Knight Bros. (Brighton), Ltd., 19, Bristol Gardens, Brighton, 7.

Blackburn.—Junior and infants' school, Bennington Lane; H. Greenhalgh, architect, 15, Mawdsley Street.

Bolton.—Crematorium, Chorley New Road; borough engineer.

Office block, workshops, etc., Settle Street; Wm. Townson & Sons, Ltd., Park Hill Street.

Carlisle.—Electrical installations in 33 flats, Wigton Road estate; city engineer, 18, Fisher Street.

Carmarthen.—Adaptations at Golden Grove mansion, farm, etc., Vale of Towy, for farm institute (£44,000); W. T. Lloyd, county architect, County Hall.

Chertsey.—Additions to Ottershaw School (£76,800) for Surrey E.C.; county architect, Kingston-on-Thames.

Crawley.—Houses (105), West Green, for Crawley Development Corporation, Broadfield; chief architect.

Croydon.—Houses, New Addington estate, south-eastern section: E. H. Smith (Croydon), Ltd., 48, Wellesley Road, Croydon (32); Grace & Marsh, Ltd., New Bridge Works, Waddon, Croydon (26); Siggs & Chapman, Ltd., Tithebarn Works, Purley Way, Croydon (26); R. Mansell, Ltd., 17, Grant Road, Croydon (26); and Wates, Ltd., 1258, London Road, S.W.16 (66).

Factory extensions, St. Andrew's Road; W. Howard Price, Ltd., bedding manufacturers, Lower Coombe Street.

Dagenham.—Houses (26), Blackborne estate; S. R. Bryett, 49, Cowslip Road, E.18.

Darlaston.—Houses (44), Cock Heath estate, for U.D.C.; Seaman Bros., New Street.

Darlington.—Houses (30); borough architect, Central Buildings.

Dundee.—Shops (36) on housing sites; city architect, 17, City Square.

Ealing.—Houses (180), Ravenor Park estate; borough engineer.

East Ashford.—Houses (40), Chilham, Ruckinge and Brabourne Lees; Jackson & Jackson, architects to R.D.C., 13, North Street, Ashford, Kent.

Edmonton.—Houses (98), Waltham Cross; borough architect, Town Hall, N.9.

Falmouth.—Infants' school; S. Gregson, county architect, County Hall, Truro.

Fife.—Offices at Belfield (£37,000); county architect, Cupar.

Guildford.—Houses (52), Bellfields estate; G. T. Crouch, Ltd., 3/5, Thames Street, Kingston-on-Thames.

Haverfordwest.—Houses (74), on nine sites, for R.D.C.; A. J. Davies, surveyor, 10, Picton Place.

Houghton-le-Spring.—Cinema, Shiney Row, for E. J. Hinge's Cinemas, Ltd.; J. H. Simson, architect, 78, Bewick Road, Gateshead.

Cinema, Fence Houses, for Nilo Cinemas, Ltd.; C. Solomon, architect, 3, St. Mary's Place, Newcastle-on-Tyne.

Houses (86) for U.D.C.; James Laing & Sons, builders, Carlisle.

Hounslow.—Flats (10 blocks of four flats each); Gee, Walker & Slater, Ltd., 100, Park Lane, W.1.

Isleworth.—Out-patients' department at West Middlesex Hospital (£75,234) for North-West Metropolitan Regional Hospital Board; Walter Lawrence & Sons, builders, 31, Sun Street, London, E.C.2.

Liverpool.—Houses (204) and flats (126), Mather Avenue estate; city architect and director of housing.

London.—WANDSWORTH.—Flats (12), Boundaries Road, Balham; Flowitt & Co., Ltd., 168, Merton High Street, S.W.19.

Block of aged persons' dwellings (£25,965), Wendlesworth estate; Gorham (Contractors), Ltd., 4, The Crescent, Goring Road, Goring-by-Sea.

BATTERSEA.—Flats, Bolingbroke Grove and Salcott Road; borough engineer, Municipal Offices, Lavender Hill, S.W.11.

CAMBERWELL.—Three-storey flats, Lordship Lane, East Dulwich; John Grey & Partner, 43, Oakley Street, S.W.3.

Lowestoft.—Rebuilding showrooms, London Road; Prices Tailors, Ltd., Kirkstall Road, Leeds.

Maidstone.—Houses and flats (64), Bearsted; G. G. Letchford, clerk to R.D.C., 26, Tonbridge Road.

Manchester.—Factory, Paston Road, Northenden, for Fielden (Electronics), Ltd., Holt Town Works, Beswick; Francis Jones & Son, architects, 178, Oxford Road, Manchester.

Extensions to works for Holden & Brooke, Ltd., Sirius Works, West Gorton; A. Booker, 28, Kennedy Street, Manchester.

Market Harborough.—Houses (16), Medbourne and Drayton; R.D.C. architect.

Melksham.—Additions to Lowbourne School for Wilts E.C.; F. I. Bowden, county architect, County Hall, Trowbridge.

Morpeth.—Extensions to Northgate Institution; J. Dodds & Sons, Morpeth.

Newcastle (Staffs).—County primary school, Hemstalls Farm (£76,374); A. C. H. Stillman, county architect, County Buildings, Stafford.

Northumberland.—Erection of kitchen dining rooms for the C.C. at Acomb County Primary School (T. D. Bird & Co., builders, Hexham); Hartburn School (J. Wilson, Ltd., builders, Morpeth); Newburn Bell's Close School (E. Jeffcock, Ltd., builders, Newcastle); and Rothbury Thomlinson's School (R. Carse & Son, Amble).

Oakengates.—Houses (18) and bungalows (4) for U.D.C.; Wm. Sharratt, Church Lane, Wolverhampton.

Ormskirk.—Houses (54), Richmond Avenue, Burscough; E. J. Wright, U.D.C. surveyor, Council Offices, Burscough Street.

Oswestry.—Permanent houses (74), Shrewsbury Road; S. Fox-Davies, architect, Memorial Hall.

Paignton.—Houses (62), Foxhole estate; S. Hodson, clerk to U.D.C., Municipal Offices, Oldway.

Penge.—Permanent flats (86), Croydon Road, for U.D.C.; surveyor, Town Hall, Anerley Road, S.E.20.

Plymouth.—Houses (60), in six groups; E. G. Catchpole, city architect, Weston Lodge, Seymour Road.

Rotherham.—Houses (48), Richmond Park Hill Top estate, Kimberworth; C. Earnshaw (Rotherham), Ltd., Coke Lane, Westgate, Rotherham.

Rugby.—Houses (156), Newbold Glebe estate, Section 1; Collins & Britton, architects, 39, Bennett's Hill, Birmingham, 2.

Runcorn.—Houses (28), Lodge Lane, Halton, for R.D.C.; A. J. King, engineer and surveyor, Castle Park, Frodsham.

St. Albans.—Schools, Tavistock Avenue (£63,889); county architect, Hertford.

Salford.—Flats (32) and 4 shops, Langworthy estate; city engineer.

Salisbury.—Flats (56), Bemerton Heath; G. Richardson, town clerk, Council House, Bourne Hill.

Shifnal.—New school for Salop E.C.; A. G. Chant, county architect, 5, Belmont, Shrewsbury.

South Shields.—Technical college for 900 students; borough engineer.

Scunthorpe.—Houses (80) and 12 flats, Lincoln Gardens estate; borough architect.

Sedgley.—Houses (38), Contract No. 4, Turners Hill housing site, for U.D.C.; Tomlinson Bros., Wolverhampton Road Sedgley. Houses (40), Contract No. 5; Barker Bros., Hermit Street, Gornal, Sedgley.

Stafford.—Flats (54), Corporation Street; T. H. Higson, borough engineer.

Stockton-on-Tees.—Houses (104), Roseworth site; Lane, Fox & Co., Ltd., builders, Fulwell, Sunderland.

Sunderland.—Houses (56), Marina Avenue; Lane, Fox & Co., Ltd., Fulwell.

Taunton.—Houses (32), Wellsprings estate; Stanwell & Son (Taunton), Ltd., Billen Street. Houses (48); F. & E. Small, The Priory.

Tynemouth.—Houses (116), Marden neighbourhood unit; William Leech, Ltd., builders, Clayton Street, Newcastle-on-Tyne.

Urmston.—Extension of workshops at Mellors Road, Trafford Park, Manchester, for Superheater Co., Ltd.

West Hartlepool.—Electrical installations in 140 houses; borough architect, Municipal Offices.

Weymouth.—Large school for Dorset E.C.; Crickmay & Sons, architects, 23, St. Thomas Street.

Whitley Bay.—Houses (48), Seatonville estate; J. W. Urpeth, builder, Bedlington.

Worsley.—Dwellings (138) and 10 shops with living accommodation, Old Clough Lane, Walkden, for U.D.C.; Harold Lomax, clerk, Town Hall, Walkden.